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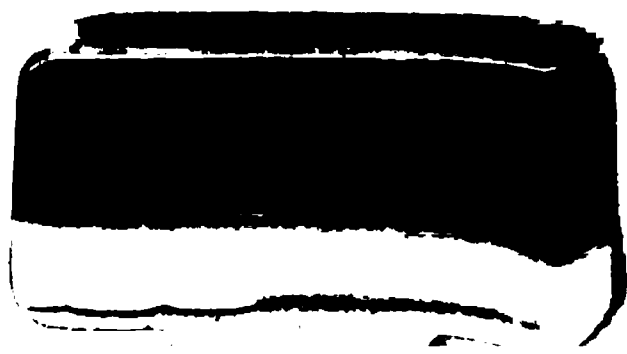
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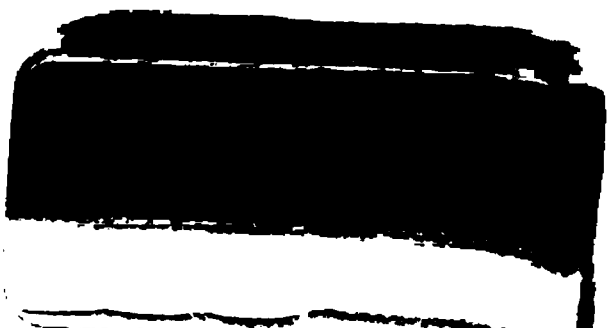
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ANNUAL REPORT

OF THE

State Engineer and Surveyor

OF THE

STATE OF NEW YORK

For the Fiscal Year Ended September 30, 1912

TRANSMITTED TO THE LEGISLATURE JANUARY 7, 1913

ALBANY
J. B. LYON COMPANY, PRINTERS
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STATE OF NEW YORK

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IN SENATE

JANUARY 7, 1913.

ANNUAL REPORT

OF THE

STATE ENGINEER AND SURVEYOR

OF THE

STATE OF NEW YORK

OFFICE OF THE STATE ENGINEER AND SURVEYOR,

ALBANY, N. Y., *January 7, 1913.*

To the Honorable the President of the Senate:

Sir.—I have the honor to transmit herewith my annual report for the year 1912.

Very truly yours,

J. A. BENSEL,

State Engineer and Surveyor.

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REPORT.

Certain of the duties of the State Engineer and Surveyor are defined by the Constitution of the State, others by the revised statutes, and still other duties devolve by virtue of the various laws enacted from time to time by the Legislature of the State, all of which deal principally with the design of and supervision of construction of various public works.

The duties of the State Engineer and Surveyor, as prescribed by the statutes of the State, have been increasing during recent years both in variety and extent, and in addition there are further fixed duties which devolve upon the State Engineer and Surveyor by virtue of his being a member of various State boards and commissions. The boards and commissions upon which the State Engineer and Surveyor acts as a member are:

The Canal Board, having authority over the construction and maintenance of the canal system of the State;

The Commissioners of the Land Office, having supervision over the sale and purchase of State lands, and the making of grants of lands under water;

The State Board of Canvassers, having jurisdiction over the canvass of the returns of elections;

The State Board of Equalization of Assessment, having jurisdiction over the equalization of the assessment of the State taxes among the various counties;

The State Highway Commission, having jurisdiction over the construction, maintenance and repair of improved and town highways throughout the state.

In addition to the above duties the State Engineer and Surveyor is a member of the Commission appointed by the Governor to coöperate with a similar Commission appointed by the Governor of New Jersey to investigate the question of port conditions and pier extensions for New York harbor, as authorized by Chapter 734, Laws of 1911.

By Chapter 9 of the Laws of 1912 the State Engineer and Surveyor was made a member of the Commission on Barge Canal

Operation, for the purpose of inquiring into the subject of proper methods to be applied in the operation and maintenance of the enlarged canals.

In conformity with the directions of the Constitution and laws I have attended during the past year the meetings of the above boards and commissions, the detailed reports of which boards or commissions will be made to the Legislature by such boards or commissions.

The principal duty of the State Engineer and Surveyor is that in connection with the improvement of the so-called Barge canal and the construction of Barge canal terminals, authorized by Chapter 746 of the Laws of 1911 as a part of the canal system.

In addition to the main duties in connection with the design of and supervision over the construction of the Barge canal and Barge canal terminals, the State Engineer and Surveyor is called upon to prepare maps, after having made the surveys, for the use of the Attorney-General in various court proceedings and to coöperate with the Attorney-General in the preparation of the State's defense of claims brought against the State. He is entrusted with the sale of lands under water and of other State lands, when so directed by the Commissioners of the Land Office. He is required by statute to make examinations of the State boundary lines and to replace monuments destroyed or damaged. He is charged with the direction of the coöperative topographic survey with the United States government and also with the coöperative hydrographic work in the gaging of the flow of the various streams of the state.

The State Engineer and Surveyor is requested during the session of the Legislature to furnish estimates and reports relative to pending legislation and perform such other duties as may be requested by the Governor or Legislature from time to time.

The various classes of work performed by the State Engineer and Surveyor will therefore be treated of under their respective heads, as follows:

CANAL MAINTENANCE.

The jurisdiction over the operation and maintenance of the canal system is vested in the Superintendent of Public Works, and from time to time special acts of the Legislature have im-

posed specific duties on that official and on the State Engineer and Surveyor.

The State Engineer and Surveyor has prepared plans and specifications and inspected the work of construction on various structures in connection with the present canal system when requested by the Superintendent of Public Works or when so directed by the Legislature.

During the past year one break of considerable size occurred in the canal at Irondequoit creek where the Barge canal follows the alignment of the old canal. This break was of extensive proportions and interfered with navigation for about six weeks. Immediately upon learning that such break had occurred I proceeded with the preparation of plans for the construction of a temporary trough so as to cause as little inconvenience as possible to those having occasion to use this section of the canal. The point in question where such break occurred is one of great importance in view of the fact that a break at such point must necessarily tie up through navigation on the canal until repairs shall have been made. Bearing in mind the importance of proper permanent construction in this locality, a thorough study of the conditions as existing and of the requirements to be met in order to maintain navigation, is being made, to the end that the most durable and modern type of construction shall be adopted to take the place of that which was partly constructed during a previous administration, but which did not take into consideration the condition and facts as existing at the culvert carrying Irondequoit creek under the canal embankment.

Several Barge canal contracts have been completed and are now in operation as a part of the canal system of the State, the care and control of such completed portions being under the Department of Public Works. Such locks and structures as have been completed and are in operation are giving entire satisfaction.

BARGE CANAL.

There has been much speculation as to when the Barge canal will be completed and whether or not, when completed, the cost of the improvement would be within the original appropriations of \$101,000,000, authorized by Chapter 147 of the Laws of 1903,

for the improvement of the Erie, Champlain and Oswego canals, and of \$7,000,000, appropriated by Chapter 391 of the Laws of 1909, for the improvement of the Cayuga and Seneca canal. I deem it my duty as State Engineer and Surveyor to place before the Legislature and the people of the State a statement setting forth what to my mind is the exact status of this undertaking, such judgment being based on the progress made to the end of the fiscal year September 30, 1912.

From an examination of the status of the work it is apparent that the construction of the Barge canal is progressing at a rapid rate, in that to October 1, 1912, there had been placed under contract work authorized by the above mentioned statutes to the amount of \$77,029,116, this figure including emergency work authorized under the so-called extra or unspecified work orders; and there had been completed work amounting to \$50,684,369, this figure also including emergency work completed under the so-called extra or unspecified work orders.

During my administration as State Engineer and Surveyor, dating from January 1, 1911, to the end of the fiscal year, September 30, 1912, a period of twenty-one months, there had been performed work to the amount of \$24,596,332. The significance of this figure is more manifest when it is borne in mind that during the six preceding years of actual Barge canal construction the value of the work performed amounted to \$26,088,037. From a comparison of these figures it is noted that during the twenty-one months of this administration work has been performed of a value approximating 95 per cent of the total work performed during the combined period of former administrations, and furthermore, this amount of work exceeds by 75 per cent the greatest amount performed by any previous administration in a similar period of time. To show this graphically the accompanying diagram is given, the circle of which represents the amount of work completed to October 1, 1912, and the shaded portion that done during the twenty-one months of 1911 and 1912.

There is also shown graphically the progress of work to January 1, 1913, bringing the progress diagram to date, in order that the exact status of the canal improvement may be known, as of January 1, 1913. To January 1, 1913, the value of the work com-

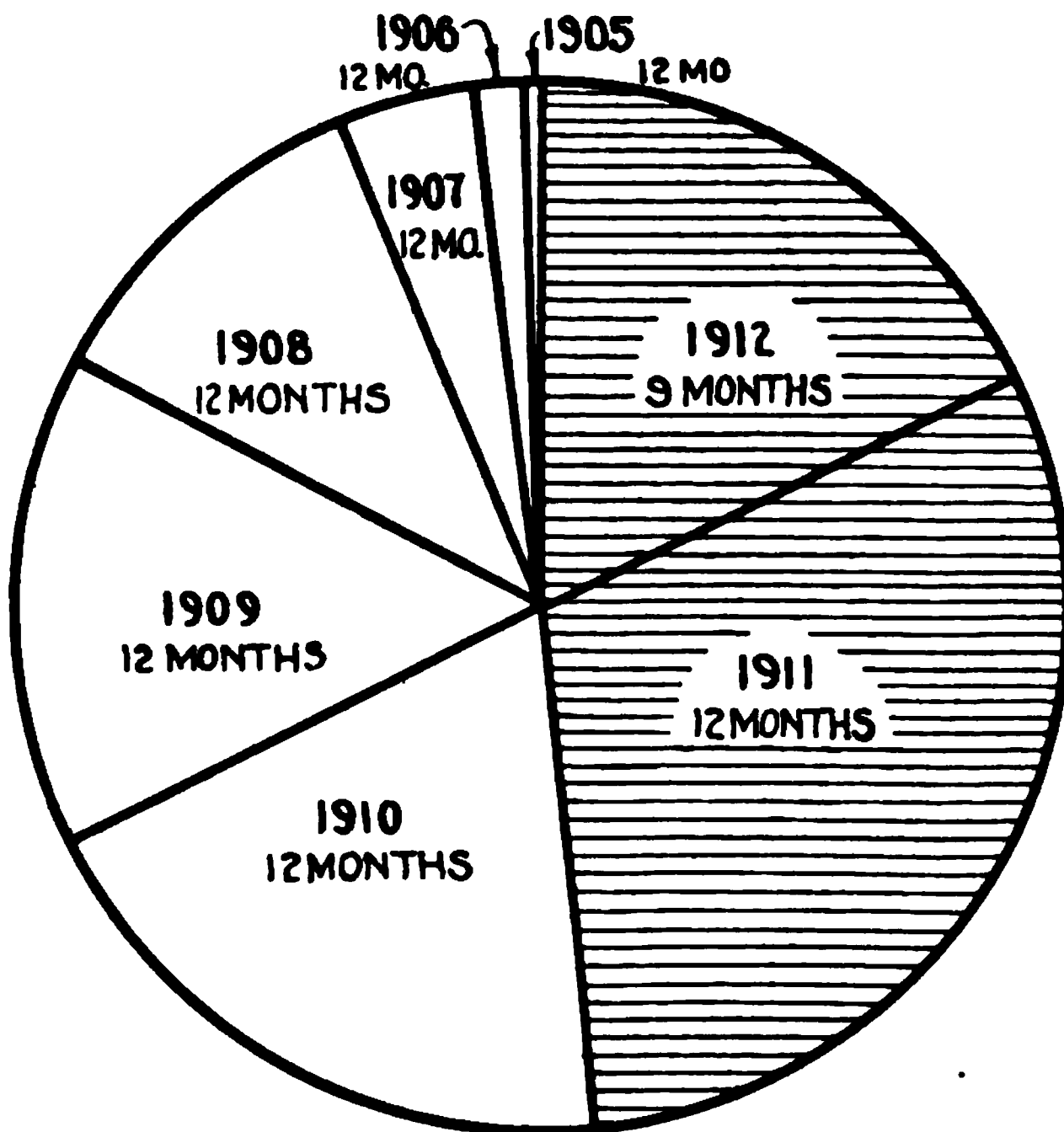
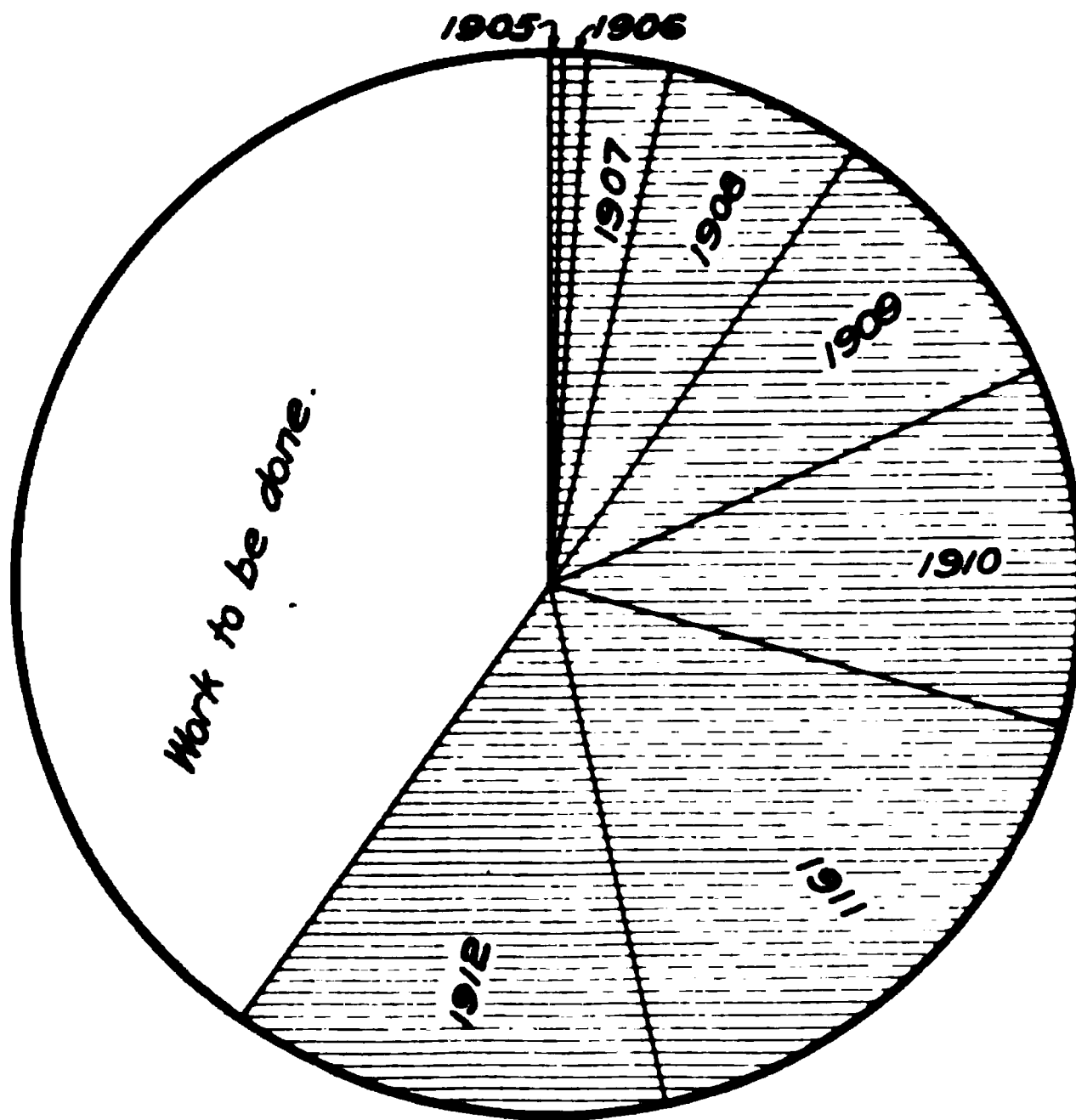
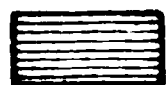


Diagram Showing By Years Proportionate
Amount of
Work Done to October 1, 1912.



**DIAGRAM SHOWING
PROGRESS OF BARGE CANAL WORK
TO JAN. 1, 1913.**

Circle represents total construction cost.



Work completed.

pleted is approximately \$54,000,000, of which approximately \$28,000,000 has been completed during my administration.

From an examination of this diagram it will be noted that the construction work is more than 60 per cent completed and that more than 50 per cent of the work completed to date has been done during 1911 and 1912.

Plans for the work remaining to be placed under contract are practically completed and such work as is included therein will be awarded at an early date, such as to permit the completion of the entire Barge canal system and have this extensive waterway ready for navigation probably in the year 1915. Inasmuch as the estimate upon which the appropriations in 1903 (Erie, Oswego and Champlain canals) and 1909 (Cayuga and Seneca canal) were made were prepared at different dates, the discussion of the two projects embraced in each of the appropriations will be considered separately.

ERIE, CHAMPLAIN AND OSWEGO CANALS.

(Chapter 147, Laws 1903, and amendatory Acts.)

Progress of Work.

First, the date for completion will be considered. At the rate with which the work is being and has been progressed, there was every reason to believe that the Champlain Barge canal would have been entirely completed and ready for navigation in the year 1913, but owing to the failure on the part of certain contractors performing work on this portion of the canal it has been necessary for the Canal Board to cancel certain contracts and to readvertise for the uncompleted portions of such work. This failure on the part of these contractors and the delay incidental thereto will set back the date for the completion of the Champlain canal more than a year, so that the best to be expected is that this portion of the Barge canal system may be completed in 1914.

Owing to difficulties encountered at the site of the dam and lock to be constructed in the Mohawk river at Scotia the completion of that portion of the canal from Waterford west has also been seriously delayed. It was not found possible, due to the nature of the underlying material, to construct this dam and

lock along the lines of the original plans. It was therefore necessary to make a careful study of the existing conditions, as a result of which study it has been found necessary to sink several caissons, in order to provide a suitable foundation for the dam and lock.

The contract for the work to be performed at this point has been relet in accordance with the modified plans and specifications, and from the progress being made on this work there is every reason to believe that the dam and lock will be completed so that the Barge canal between the Hudson river and the city of Oswego on Lake Ontario, the terminus of the Oswego canal, will be completed and in readiness for navigation in 1914.

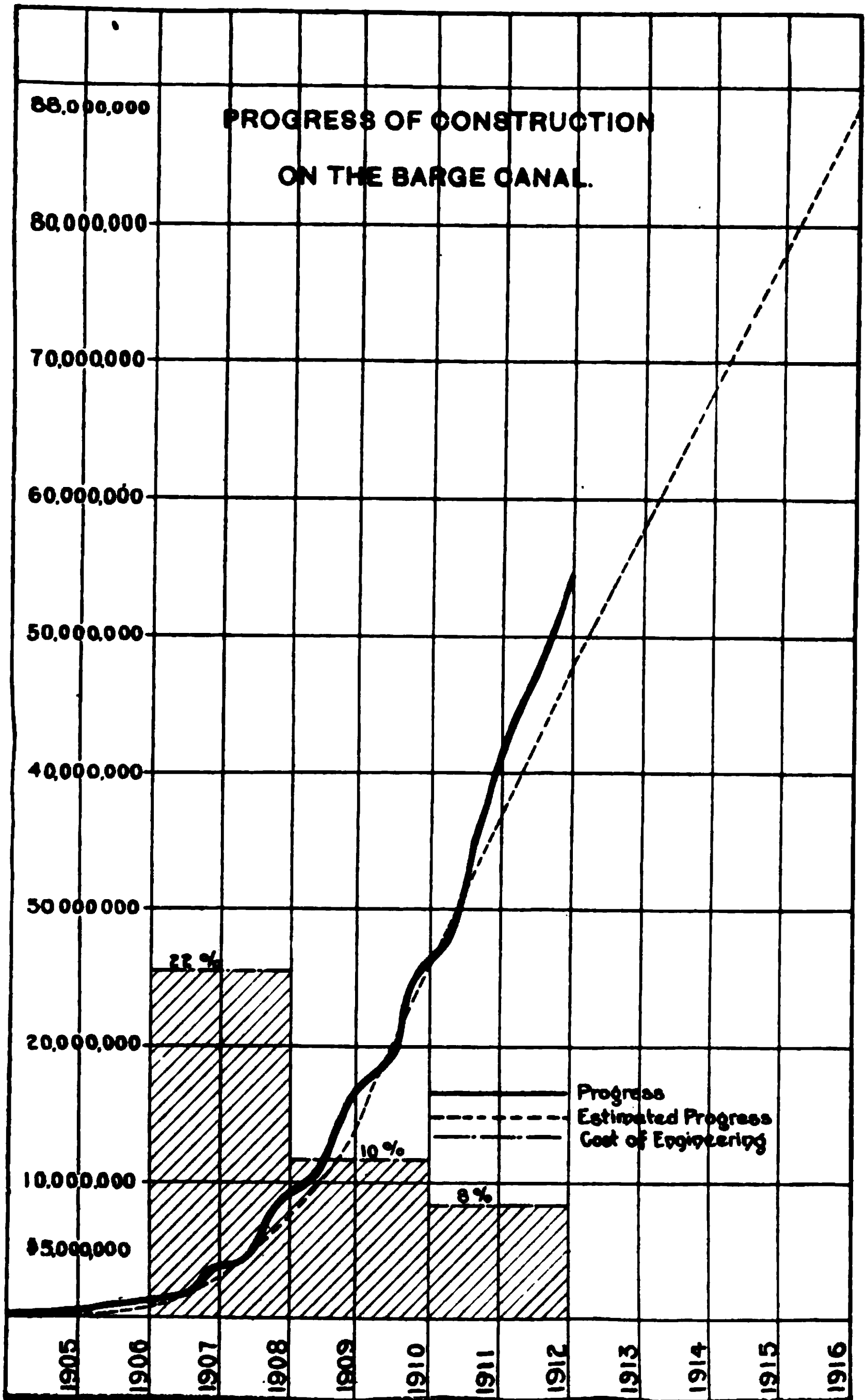
The progress of the work on that portion of the canal west of the junction of the Oswego and Erie canals at Three River Point is such as to warrant the expectation of having this section of the system completed in 1915, thereby placing that portion of the Barge canal, including the Erie, Champlain and Oswego canals, in condition for navigation during the season of 1915.

To October 1, 1912, many of the Barge canal contracts had been completed and certain sections of the improved canal used as a part of the canal system. Upon the resumption of navigation in the spring of 1913 there will be completed approximately 140 miles of the improved Barge canal.

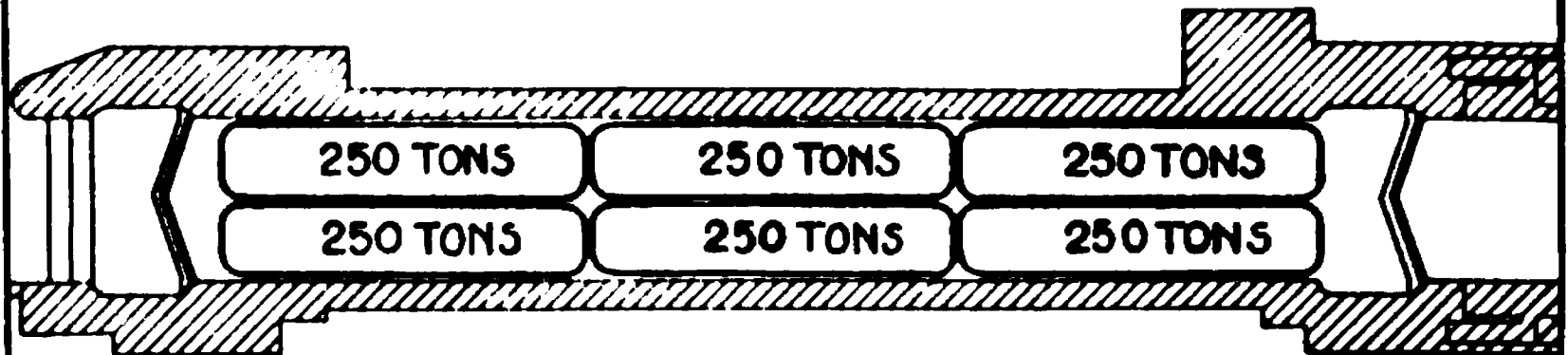
In connection with the probable date for the opening of the Barge canal for navigation, I desire to call your attention, as stated elsewhere in my report, to the so-called Troy dam across the Hudson river at Troy, which dam and lock form the key to the entire Barge canal system of the State of New York. It is therefore imperative that the work on this dam and lock, whether performed by the Federal authorities or by the State of New York, should be completed without delay, thereby affording a lock of such dimensions as will accommodate boats of maximum Barge canal capacity.

Financial.

After having made an investigation of the possible cost for constructing a Barge canal, a report was submitted to the Legislature in 1901 by the then State Engineer, setting forth the estimated cost of construction along the various routes as then contemplated. In 1903 the then State Engineer, in answer to certain questions

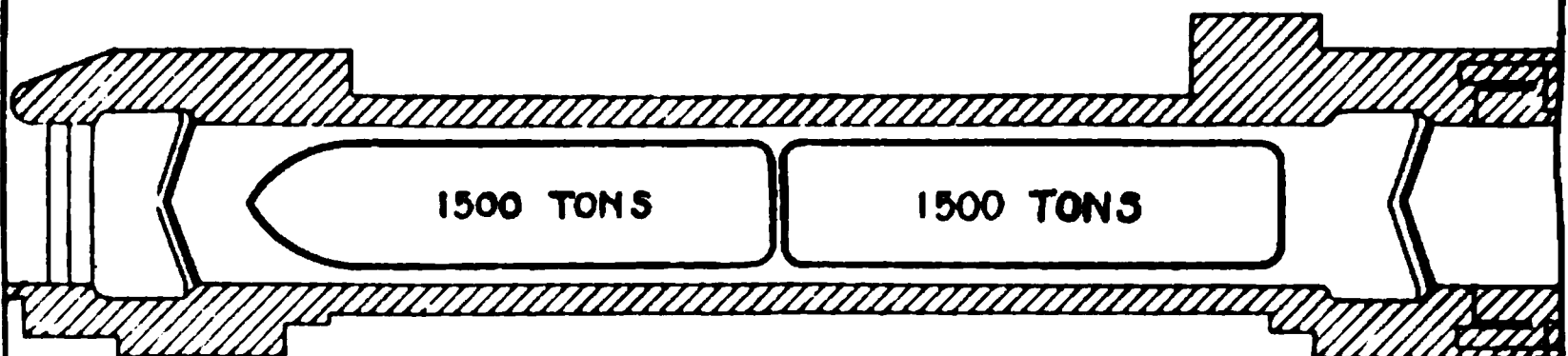


**PLAN OF NEW BARGE CANAL LOCK
SHOWING SIX ERIE CANAL BOATS OF PRESENT SIZE.**



These Locks will accommodate a barge of 3000 tons capacity, 35 feet beam - Future widening will permit the use of barges of 3600 tons capacity 42 feet beam.

**3000 tons will fill 75 freight cars of 80,000 lbs each
3600 tons will fill 90 freight cars of 80,000 lbs capacity each**



CAPACITY OF NEW CANAL.

New boats will carry fully 10 times as much as old boats, at an average speed of 2.5 times the speed of the old boats. Therefore the capacity of the new canal will be 25 times the capacity of the present canal. As more than half of the new line is through lakes or natural river channels, a greater average speed is possible.

contained in a resolution adopted by the Assembly on February 10, 1903, submitted certain data in which the total estimated cost of the Barge canal project was fixed at \$100,562,993, based upon the prices for labor and material governing at the time of making such report. With this information at hand and the information contained in the report of 1901 the Legislature enacted Chapter 147 of the Laws of 1903, authorizing the issuance of bonds to the amount of \$101,000,000 for carrying out the work embraced in this act, which, having been submitted to the people, was approved at the fall election of that year. In considering my report relative to the status of the canal work authorized by this statute, the estimates submitted to the Legislature in 1901 and 1903, together with the available details used in compiling such estimates, have been consulted for comparison, and it appears that the principal items of cost considered were:

(1) Actual cost of canal construction, together with highway bridges and construction of relocated highways.

(2) Cost of railroad bridges.

(3) Cost of engineering, contingencies and unforeseen expenses.

(4) Land and water power damages.

It should be borne in mind that the prices of labor and materials have increased to a considerable extent since the enactment of the Barge Canal Law; that the size of the locks has been increased by widening from 28 to 45 feet; that the grade has been lowered by legislative enactment between Tonawanda and Lockport and the rock cut at Lockport widened; that this work was done without additional appropriation, but has added to the cost of construction approximately \$4,500,000; and further, that recent legislative enactment now requires certain increased fixed charges such as bonds and liability insurance, which of course must eventually be paid by the State, as they are included in the bids received for the various contracts. To offset a portion of this added burden the appropriation of 1903 has been relieved to date of the construction of the canal from Tonawanda to Buffalo, the construction of the Troy dam, and a slight decrease in the expense of the work east of Lockport, due to changing the grade of the canal; the saving as a result of which items is estimated at \$3,500,000.

As a result of my investigation and study of the conditions with reference to the Barge canal improvement it is my opinion that the cost of the actual construction as contemplated in 1903 and the cost of engineering in the preparation of plans and specifications and the supervision of construction appertaining to this improvement will be performed within the estimated amount for such items, but that the whole project as contemplated by Chapter 147 of the Laws of 1903 and amendatory acts cannot be completed within the original appropriation of \$101,000,000. The principal excess in the cost of this undertaking is in connection with the appropriation of lands and structures, together with damage to water powers and riparian rights, for which items the allotment in the 1903 estimate appears to have been greatly deficient. The above deduction drawn with reference to this work is based upon a careful study of the facts and conditions known, which may be briefly summarized as follows:

The value of the work contracted for as included in original contracts, supplemental alterations and extra work orders authorized to October 1, 1912, amounted to \$74,794,998. Of the work included in these contracts, supplemental alterations and extra work orders there had been completed to October 1, 1912, work to the amount of \$49,734,869. The estimated cost for the completion of the actual work of canal construction remaining to be performed pursuant to Chapter 147 of the Laws of 1903 and amendatory acts which will be awarded in the near future is \$7,406,495, and the cost of reconstructing certain highways destroyed as a result of Barge canal improvement, which must be relocated pursuant to the provisions of the Canal Law, is estimated to be \$455,212, which is a necessary part of the canal expenses. Taking into consideration the payments made on the final accounts for the 28 Barge canal contracts completed and for which final payments are less by approximately \$500,000 than the original contract prices, together with the contract prices for work not completed and the estimated cost of work not now under contract, the total estimated cost for the Barge canal construction, exclusive of the cost of constructing new railroad bridges over the Barge canal and omitting the item of land and water damages, is \$83,293,872.

BAROE CANAL, CONTRACT NO. 15.

View of entrance of Champlain canal into Lake Champlain, at Whitehall, showing a siphon spillway on the left, a movable dam in the center, operated from the highway bridge and regulating Wood creek, and lock No. 12 with its power house on the right.

In 1903 the estimated cost of construction work within the territory covered by the above estimate was \$77,572,906, to which there should be added the proportionate amount of the estimate included in the contingent item inserted therein to cover erroneous estimates or increased cost due to encountering unforeseen conditions, for which items have been included in the estimate of 1912 as items of construction.

The above figure of \$77,572,906 does not include the estimated cost of the construction of the Troy dam nor the improvement in the Niagara river from Tonawanda to Buffalo.

In answer to the questions submitted by the Legislature in 1903 it was set forth that it would be necessary to construct 27 railroad bridges, the estimated cost of such bridges as appearing in the detail used in the preparation of the estimate being \$4,042,765. The present estimate for the construction of these bridges at the points where considered necessary in 1903 now being placed at \$4,401,173. In the preparation of the 1903 estimate the cost of highway bridges was considered in the general estimate of the cost of construction, in which item the cost of highway bridges has been included in the present estimate, but it is very evident that the cost of bridges, both highway and railroad, must be greater than as estimated in 1901, in view of the fact that by legislative enactment it has been necessary to provide bridges of a movable type or of such type as may be converted into a movable type of bridge, over certain portions of the canal, and further that the demands of highway traffic are such that it has been necessary to provide a bridge of greater width of roadway and of greater strength than was contemplated in 1903. No attempt has been made to determine definitely the difference between the cost of the highway bridges as estimated in 1903 and the cost of such structures as estimated at the present time, as these items appear in the estimated construction cost.

Railroad Bridges over Barge Canal at the Site Where Bridges Cross the Present Canal.

At certain points where the alignment of the Barge canal follows that of the present canal it will be necessary to reconstruct certain railroad bridges in order to provide a span and clearance

sufficient to meet Barge canal requirements. At such points the present structures exist by virtue of revocable permits issued, pursuant to authorization of the statutes, by the Canal Commissioners or by the Superintendent of Public Works, who succeeded in power and authority the former Board of Canal Commissioners in 1878. It has been the contention of the State that the cost of reconstructing such bridges, in order to meet the demands of the increased navigation facilities to be provided by the Barge canal improvement, should be borne by the railroad companies, but certain of the railroad companies have contended that the burden of making such changes as are necessary to meet the Barge canal requirements must be met by the State. This question will undoubtedly be carried to the courts of the State for a determination, as have certain other questions with reference to the cost of constructing bridges over the Barge canal, and until the courts shall have decided as to what parts the railroad or the State shall bear of such burden, there will be an uncertain element in the cost of reconstructing such bridges for which no account was made in 1903. The cost of construction for such structures is now estimated at \$3,445,000, but this has not been included in the total estimated cost.

Operating Machinery.

Embodied in the 1903 estimate there was included an item of \$729,644 for operating machinery for the locks, the width of the lock then contemplated being 28 feet. As stated elsewhere in my report the locks have been widened to 45 feet, which not only increases the cost of construction of the locks proper but also the cost of installing the necessary operating machinery, so that the present estimated cost of operating machinery for the Barge canal system is \$2,492,847, included in which figure is an item of \$46,800, covering the cost of operating machinery for the movable dams along the Mohawk river, which item was not considered in 1903, as at that time it was not proposed to construct movable dams in the Mohawk.

Engineering and Contingencies.

In 1903 an allowance of 10 per cent was made for engineering and contingencies, to which a further allowance of 5 per cent was added "for estimates that may prove erroneous," due to unfore-

BAROE CANAL, CONTRACT NO. 55.
Completed dam and partially filled Delta reservoir.

2000

seen difficulties, etc., from which it is gathered that approximately \$11,793,273 was estimated to cover such items as engineering, contingencies, unforeseen emergency work included in what is commonly called extra work, possible erroneous estimates, administration and overhead charges, which were not definitely known but would develop as the work progressed.

The incidental emergency work and unforeseen items for which allowance was made at the time of the preparation of the estimate in 1903 have been included in the estimated cost of actual construction in the present estimate, and therefore only the question of engineering and contingent expenses will be taken up under this head.

The State Comptroller had made payments covering expenses incurred to October 1, 1912, for items other than on contractors' estimates and for extra work orders, and damage settlements, as follows:

Engineering	\$6,222,488 99
Advisory Board of Consulting Engineers.....	288,322 29
Comptroller	253,143 35
Superintendent of Public Works (administration, special agents and witness fees).....	403,089 64
Special Examiner and Appraiser, and former Board of Special Examiners and Appraisers.	145,558 91
	<hr/>
Making a total of.....	\$7,312,603 18
	<hr/> <hr/>

paid on account of engineering and contingent expenses for obligations to October 1, 1912, other than payments on account of construction, cost of relocated highways, or in settlement on account of claims for damages.

Taking these figures as a basis and giving a liberal consideration to the same, it is estimated that the total cost of the above items in order to complete the Barge canal will be:

Engineering	\$8,000,000 00
Advisory Board of Consulting Engineers.....	288,322 29
Comptroller	350,000 00
Superintendent of Public Works (administra- tion, special agents and witness fees).....	600,000 00

Special examiner and appraiser, and former
board of special examiners and appraisers... \$225,000 00

\$9,463,322 29

making a total of — say — \$9,500,000 to cover items included in the contingency estimate of 1903 other than extra or emergency work, correcting erroneous calculations or estimates, which two items have been included in the present estimate of actual cost of construction. This total deducted from the 1903 estimate for contingencies would give a balance of \$2,293,273, which can properly be added to the 1903 estimate for actual construction, and summarized as follows, excluding the consideration of land or water power damages, we find,

	1903.	1912.
Total estimated cost of construction	\$77,572,906	*\$83,293,872 00
Railroad bridges	4,042,765	4,401,173 00
Engineering, administration and contingencies, Comptroller, and Superintendent of Public Works, etc.	11,793,273	9,500,000 00
	<hr/> \$93,408,944	<hr/> \$97,195,045 00
Increased cost, due to burden added without additional appropriation		4,500,000 00
		<hr/> \$92,695,045 00
		<hr/>

This estimate of \$97,195,045 does not include the item of \$3,445,000 for the estimated cost of constructing bridges at points where there are existing bridges over the present canal, inasmuch as the question as to who shall defray the expense of such construction has not as yet been definitely determined. Deducting from the total estimate for 1912, as stated above, the items of increase in expense by reason of additional burdens,

* Includes certain work covered in 1903 contingent item.

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amounting to \$4,500,000, placed upon the Barge canal appropriation by reason of legislative enactment without providing for additional appropriations, it will make the present estimated cost of construction within the 1903 estimate covering the same territory. In the comparison of the 1903-1912 estimates the item for work which it was proposed to perform from Tonawanda to Buffalo and at the site of the Troy dam has not been included, the estimated cost for which projects was approximately \$1,500,000.

From these figures it is therefore apparent that there is approximately \$3,800,000 available with which to make payments in settlement on account of the appropriation of lands and water power rights. The total estimated cost of the right of way in 1903 was \$4,712,114, and it was estimated that the State would realize from the sale of abandoned lands the sum of \$1,966,391, leaving a balance estimated for the payment of land damages of \$2,745,723. The 1903 estimate included an item of \$188,500 for paying riparian damages to property owners along the Oswego river, it being held the estimated cost of lands would be sufficient for the payment of riparian damages at other points. The total net estimated cost therefore of lands and water power rights in 1903 was \$2,944,223, after deducting the estimated return from the sale of abandoned canal lands.

In view of the uncertainty as to the position to be taken by the courts in the consideration of claims for damages on account of water power appropriation, no attempt has been made to estimate the probable amount necessary to settle such claims. Inasmuch as a great many settlements have been made by the Special Examiner and Appraiser of awards made by the Board of Claims and the Court of Claims on account of appropriation of lands and buildings, such settlements of awards have been taken into consideration and by a comparison in connection with adjacent property which has been appropriated for canal purposes and for which settlements have not been made, a conservative estimate of the cost of lands necessary for Barge canal construction is placed at least \$8,000,000, this figure not including any item on account of water power settlements.

The State Comptroller has already made disbursements on account of Barge canal construction approximating \$58,000,000, of which approximately \$45,000,000 cover payments made to contractors on account of monthly estimates submitted, embracing 90 per cent of the value of work, together with certain of the final estimates for completed contracts. During the coming year a greater number of the large contracts will be completed and it will be necessary for the State to make final payment including the retained percentage which has been held by the State during the life of the contract, and it will therefore be necessary for the Comptroller during the next two years to make disbursements in greater amounts than heretofore on account of the actual construction work. In addition to this the expenses of the different departments for administration, etc., must be met and the awards made by the Board of Claims and settlement agreements made by the Special Examiner and Appraiser must be paid.

It would therefore seem that within the course of the next two years, unless some action is taken by the Legislature, a condition will exist wherein the total appropriation of \$101,000,000 will have been exhausted and the State will be under further obligations for expense for which there will be no funds available for payment. I do not feel that the remedy to meet this situation is one which can be determined without careful consideration of all the facts as existing, and I therefore recommend to the Legislature the careful consideration of the enactment of some legislation to the end that funds shall be available when the same shall become necessary with which to meet this additional expense above the \$101,000,000 heretofore authorized, which excess in expenses is due principally to the increase in the cost of lands and waters taken for Barge canal purposes above the estimate of 1903.

CAYUGA AND SENECA CANAL.

(Chapter 391, Laws of 1909.)

Chapter 391, Laws of 1909, appropriated the sum of \$7,000,000 for the improvement of the Cayuga and Seneca canal, this statute having been submitted to and approved by the people in the same manner as Chapter 147 of the Laws of 1903. This act provided for the improvement of the Cayuga and Seneca canal to

BARGE CANAL, CONTRACT NO. 104.

False work and steel reinforcing ribs for concrete arch bridge at Broadway, Fulton. The four arches shown are being built by the city. The State builds one arch over the canal, which is located at the right side of the view. Each arch has a clear span of 145 ft. There will be a roadway 34 ft wide and two sidewalks, each 7 ft wide.

1904

Barge canal dimensions the same as those for the Erie, Oswego and Champlain canals, connecting the Erie canal with Cayuga lake and Seneca lake, thereby placing in water communication the sections of the state bordering on these lakes. The work embraced in the Cayuga and Seneca improvement will be completed at such time as to permit of the navigation of this part of the Barge canal system upon the completion of the Erie canal system, namely, in 1915.

Progress of Work.

To October 1, 1912, the work under contract, including supplemental alterations and extra work orders, amounted to \$2,234,118, and the value of the work completed amounted to \$949,500.

The contracts in force to October 1, 1912, embraced the work necessary to connect the Erie canal with the deep water of Cayuga lake, enlarging to Barge canal dimensions the Ithaca inlet, the improvement of approximately one-half the distance between Cayuga lake and Seneca lake, by the canalization of the Seneca river, and the construction of the canal of Barge canal dimensions from Watkins, the southerly end of Seneca lake, to Ayres street in Montour Falls.

The work embraced in the contracts for which proposals were invited to be opened by the Superintendent of Public Works December 31, 1912, embraced the construction of a dam and locks together with incidental canal work in the vicinity of Seneca Falls, and the construction of a dam and lock together with incidental work at Waterloo.

There remains to be placed under contract other than this work but one contract of any material size, that being for dredging the balance of the canal prism in the canalization of Seneca river, which work will be completed in one spring season.

The status of the work on this improvement is such that there is no doubt but that the entire Cayuga and Seneca canal will be completed and in readiness for operation in 1915.

Financial.

Investigation as to the probable cost of completion of the work authorizing the improvement of Cayuga and Seneca canal has been made along the same lines as that considered in connection

with the Erie, Champlain and Oswego canal improvement. In considering the financial phase of this work it should be borne in mind that the enlargement of the Ithaca inlet to Barge canal dimensions, while properly a part of the Cayuga and Seneca canal, was not contemplated at the time of the preparation of estimate in 1909, and further that by the enactment of Chapter 453 of the Laws of 1911 an additional expense was added, in that it was provided to improve the canal to Barge canal dimensions from Watkins to Ayres street in Montour Falls. The increased cost on account of these two added improvements is approximately \$425,000, exclusive of any cost to be incurred in the appropriation of additional lands.

From a result of the study of the condition of this work it is found as follows:

Amount under contract, as affected by alterations and extra work orders to October 1, 1912...	\$2,234,118 00
Estimated cost of work remaining to be per- formed, which will be awarded in the immedi- ate future	3,245,054 00
Estimated cost of engineering and miscellaneous expenses, such as expenses of Comptroller, Su- perintendent of Public Works, and Special Examiner and Appraiser	500,000 00
<hr/>	
making a total of	\$5,979,172 00
say	\$6,000,000 00

for the cost of actual canal construction, relocated highways, high-
way bridges, engineering and incidental expenses, but not includ-
ing any allowance for the payment on account of the appropria-
tion of lands or water powers. It is therefore apparent that there
is a balance of but \$1,000,000 for the payment of damages on
account of the appropriation of lands and water powers in con-
nection with the work authorized by this act. The estimated
cost of reconstruction of railroad bridges over the Cayuga and
Seneca canal at points where bridges exist at the present time
under terms of revocable permits is \$500,000. This item is not
included in the above total for the same reason as set forth in

Lock No. 17, at Little Falls. View from a hill just south of the West Shore tracks, showing also the main part of the city in the background.

BARGE CANAL, CONTRACT NO. 31.

the consideration of the Erie, Champlain and Oswego canal situation.

Supplemental agreements and awards by the Board of Claims on account of the appropriation of lands for the Cayuga and Seneca canal have not been made to any great extent, but from an examination of the lands and water powers to be appropriated it is estimated that the cost in settlement on account of such appropriation will be slightly in excess of this balance of \$1,000,000, and therefore similar consideration should be given to this phase of the Cayuga and Seneca canal improvement as in the case of the Erie, Champlain and Oswego canal improvement.

TROY DAM.

The attention of the Legislature was called in my report for the year 1911 to certain conditions governing in connection with the construction of a dam across the Hudson river in the vicinity of Troy, which dam will be the key to the Barge canal system of the State of New York.

Your honorable body is undoubtedly familiar with the steps taken by the former Canal Board toward canceling leases for the use of surplus waters at the site of the present dam and of the action on the part of the Federal authorities in assuming jurisdiction over the upper waters of the Hudson river and of the construction of a dam at the point in question. Accordingly the Federal authorities proceeded with the preparation of plans and specifications for a dam and lock to be constructed in the vicinity of Troy, approximately 1,400 feet above the site of the present dam. Proposals were invited for carrying on this work in accordance with the plans prepared, but no bid was received which approximated the estimate of the Army Engineers close enough to warrant the award of such contract. As a result, the United States Government has determined to proceed with the construction of this dam with their own forces.

It is important that the Troy dam shall be completed as soon as the Barge canal is completed in order to permit boats of Barge canal dimensions to be locked through from the upper pool to the Hudson river below the Troy dam.

At the site of the Troy dam it will be possible to install a power development plant of considerable size and there will be available for sale a large amount of power. This dam being within the bounds of New York State, it would appear just and proper that any revenue derived therefrom should properly be paid into the treasury of the State of New York, and furthermore, that the State of New York should have control over the structures at the entrance to the Barge canal system.

I would therefore recommend for your careful consideration the questions arising in connection with the Troy dam situation, to the end that, if so deemed advisable, the necessary steps may be taken and an endeavor be made to return to the control of the State of New York the construction of and jurisdiction over the Troy dam, together with the disposal of power available at the site of this structure.

COMPLETED CANALS.

Certain sections of the Champlain canal are already in operation, and the contracts for the balance of the work will be progressed with the greatest speed possible, to the end that this particular section shall be open at an early date.

There are also sections of the other canals in operation at the present time, and many others will be completed during the next construction season. It is therefore imperative that proper outlets should be provided at the junctions with the Hudson river, with Lake Champlain at Whitehall, with Lake Ontario at Oswego and with the Niagara river and Lake Erie at Tonawanda and Buffalo.

The waters at these points are under the control of the Federal authorities, and certain improvements are being carried on or are contemplated at the outlets of the Barge canal, such as will provide a channel of twelve feet depth, the same as that governing throughout the Barge canal system. It is therefore recommended that the Legislature of the State of New York, by concurrent resolution, or by such act as is proper, call the attention of the Federal authorities to the status of the Barge canal work, and to the necessity of prosecuting the work under Federal jurisdiction without delay, in order to provide adequate outlet for the Barge canal at the points above mentioned.

BARGE CANAL, CONTRACT NO. 40.

The guard gate near Wendleton. This structure protects the canal against a destructive inflow from Lake Erie in case of a break in the Lockport locks.

SALE OF SURPLUS WATERS.

The possibilities for the State to derive a considerable revenue from the sale of surplus waters or power created at certain points along the Barge canal are great. In the early operation of the canal system the State disposed of surplus waters from the canal for nominal rentals and the authorities now in charge of the Barge canal construction have been confronted with certain of such leases, the terms of which have caused more or less discussion as to the rights conveyed thereby.

The attention of the Legislature is called to the possibility of deriving revenue from the sale of such surplus waters as may be available without injuring private interests or being of detriment to canal operation, to the end that the enactment of proper legislation may be given careful consideration.

Your attention is again called, as in my report of 1911, to the apparent conflicting provisions of the statutes relative to the disposal of surplus waters or power created as a result of the Barge canal improvement, and particularly to Chapter 494 of the Laws of 1907, amending Chapter 147 of the Laws of 1903, and to section 400 of the State Conservation Law, enacted by the Legislature of 1911. The latter amended statute provides that the State Conservation Commission shall have jurisdiction over the sale of such surplus waters as may be created and that the Superintendent of Public Works shall construct necessary regulating gates and appliances to properly control such waters. It is provided in this section that the funds derived from the sale of such surplus waters shall be paid into the General Fund of the State Treasury, to which provision your attention is particularly invited, in that as a matter of equity the revenue derived as a result of the expenditure of funds authorized by the people of the State of New York for the canal improvement should properly be applied toward the cancellation of the debt thereby incurred, and therefore such moneys derived as revenue should properly be paid to the Canal Fund for the retirement of the bonds issued for canal improvement and for the payment of interest thereon.

OLD CANAL LANDS.

The attention of the Legislature is particularly called to the condition which will exist upon the completion of the Barge

canal along the lines as authorized by Chapter 147 of the Laws of 1903, providing for the enlargement of the Erie, Champlain and Oswego canals, and by Chapter 391 of the Laws of 1909, authorizing the enlargement of the Cayuga and Seneca canal.

The alignment of the Barge canal in certain localities follows that of the present canal, as a result of which the Barge canal is superimposed upon the present canal. In such cases the Barge canal enlargement consists in increasing the dimensions of the present canal prism and the construction of suitable structures and embankments in connection therewith. At certain other points the alignment of the Barge canal deviates from that of the present canal, as a result of which there are many sections of the present canal which will be isolated and of no further use for purposes of navigation, due in some cases to the fact that there will be no source of water supply for feeding such sections and due to the other condition that no provision is made for a means of connection between the old canal and the Barge canal, the water surfaces in the new and the old canals being at different levels.

In the original Barge Canal Law it was provided at certain particular localities that junction locks should be constructed. The Barge Canal Terminal Law provides that the section of the present canal system from Rome to Mohawk shall be maintained as a part of the Barge canal terminal system, but no provision is made for funds to construct the necessary junction locks at Rome and at Mohawk.

There is attached hereto a map showing the sections of the present canal which will be cut off from connection with the Barge canal. It is evident that the question as to what disposition shall be made of these portions of the canals so cut off should be one for the consideration of the present Legislature.

There is a constitutional provision which prohibits the sale of any of the canals of the State, but it has been the practice in the past for the Canal Board to abandon and to dispose of certain small tracts of canal lands which have been no longer considered necessary for canal purposes pursuant to the general statutes and consolidated laws relative to this question. It is also provided in the Barge Canal Law that the proceeds derived from the sale of canal lands not considered necessary as a part of the Barge

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canal system shall be applied toward defraying the expenses of the improvement authorized by such act.

In view of the apparent conflicting provisions of the Constitution and enactments of the Legislature, your attention is called to the condition as outlined above to the end that proper legislation may be enacted, so as to guide the State officials in disposing of such parts of the present canal system as will not form a part of the Barge canal improvement and for enacting necessary legislation to provide for connecting the old canal and the Barge canal at Rome and Mohawk. In many of the cities stretches of the present canal system will have no connection with the Barge canal and when such sections are abandoned as a part of the canal system they can undoubtedly be disposed of either to the municipalities for the purpose of converting the same into boulevards or parkways, or it may be that in disposing of these isolated sections, by selling them to railroads better facilities may be provided for railroad communication for the particular localities and afford better railroad connections with the canal system thereby increasing the transportation facilities.

The attention of the Legislature is particularly invited to this question.

WIDENING OF LAND LINE.

Pursuant to the direction of Chapter 147 of the Laws of 1903 certain sections of the canal prism, known as the land line sections have a minimum bottom width of seventy-five feet, this being the minimum bottom width specified in the original act. As stated elsewhere in this report the locks on the canal system have been widened from 28 to 45 feet, thereby permitting the lockage of boats of 42 feet beam.

Certain of the traffic over the Welland canal in Canada entering into Lake Ontario will undoubtedly utilize the Barge canal system from Oswego, the terminus on Lake Ontario, to New York city, on the Atlantic coast. The locks will accommodate the boats which will navigate the Welland canal, but over certain sections (approximately 50 miles) where the minimum bottom width of 75 feet has been provided, it would not be possible for two boats of maximum lock capacity to pass.

The attention of the Legislature is called to this condition and

it is recommended that the question of making an additional appropriation, in order to provide for an increased width to 110 feet bottom section over the present sections having a width of 75 feet on the bottom, be considered by the Legislature, the estimated cost of such widening being \$2,000,000.

BARGE CANAL TERMINALS.

Chapter 746 of the Laws of 1911 authorized the issuing of bonds in the amount of \$19,800,000 for the purpose of constructing terminals for the Barge canal system throughout the state. This act was submitted to the people at the fall election of 1911 and was duly approved by the people in November. Immediately upon learning of the approval of this project by the people of the state, steps were taken to perfect an organization for carrying out the terminal work, of making surveys, investigations and the preparation of plans and specifications, pursuant to the provisions of this act.

While the Terminal Law described in a general way the location of certain terminals, still the question of exact location was left for determination by the State Engineer and Surveyor and the Superintendent of Public Works, subject to the approval of the Canal Board.

The people throughout the state have shown intense interest in the terminal question, and, to the end that the various localities might be provided with terminals which would conform to the plans for the Barge canal construction and at the same time meet the commercial demands of the particular localities, public hearings and meetings, personally conducted by me, have been held at the various points where terminals are to be located, to the end that the desires of the people with respect to the location of terminals might be obtained, and that the people being familiar with the demands of local traffic and with the local commercial conditions, might offer suggestions before a final determination as to the terminal location should have been made.

Accordingly, upon the site of the terminal having been determined, such location plan was submitted to the Canal Board for approval, after which approval the plans and specifications in detail were immediately prepared, submitted to the Canal

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BIRD'S-EYE VIEW FROM A HILL IN WHITEHALL, SHOWING SIX MILES OF COMPLETED BARGE CANAL; ALSO THE OLD CANAL AT THE RIGHT OF THE
BARGE CANAL, CONTRACT NO. 15.
NEW CHANNEL.

Board, as required by law, and proposals for the work embraced in the particular contracts invited.

To the end of the present fiscal year location plans for Barge canal terminals for the following localities have been approved by the Canal Board: Ithaca, Albany, Little Falls, Utica, Gowanus Bay (South Brooklyn), Schuylerville, Schenectady, Rome, Lockport, Mechanicville, Fonda, Fort Edward, Greenpoint (North Brooklyn), Amsterdam, Erie Basin (Buffalo), Herkimer, Ilion, Troy, Constantia, Syracuse, Cleveland, Watkins, Port of Call (New York city) and Dresden.

Contracts have been entered into providing for the construction of terminals at the following localities: Ithaca, Albany, Little Falls, Mechanicville, Fort Edward, Schenectady and Herkimer.

Plans have been completed for the terminals at Gowanus Bay, Whitehall, Fonda, Ilion, Amsterdam, Rome, Lockport and Utica, and partly completed for Troy and Syracuse.

The construction work on the terminals will be progressed with all possible speed, to the end that, upon the completion of the improved waterway throughout the state of New York, adequate facilities shall be provided, and that the people may avail themselves of the use of this means of transporting their products and place the greater percentage of the people of the state of New York in water communication, not only with one another, but with the neighboring states and those bordering upon the Great Lakes and along the Atlantic coast.

It is important to note that the referendum providing for the construction of Barge canal terminals was the only proposition submitted to the people in 1911 which met with their approval, manifesting the interest shown by the people in the development of their waterways at their own expense and without aid from the Federal authorities.

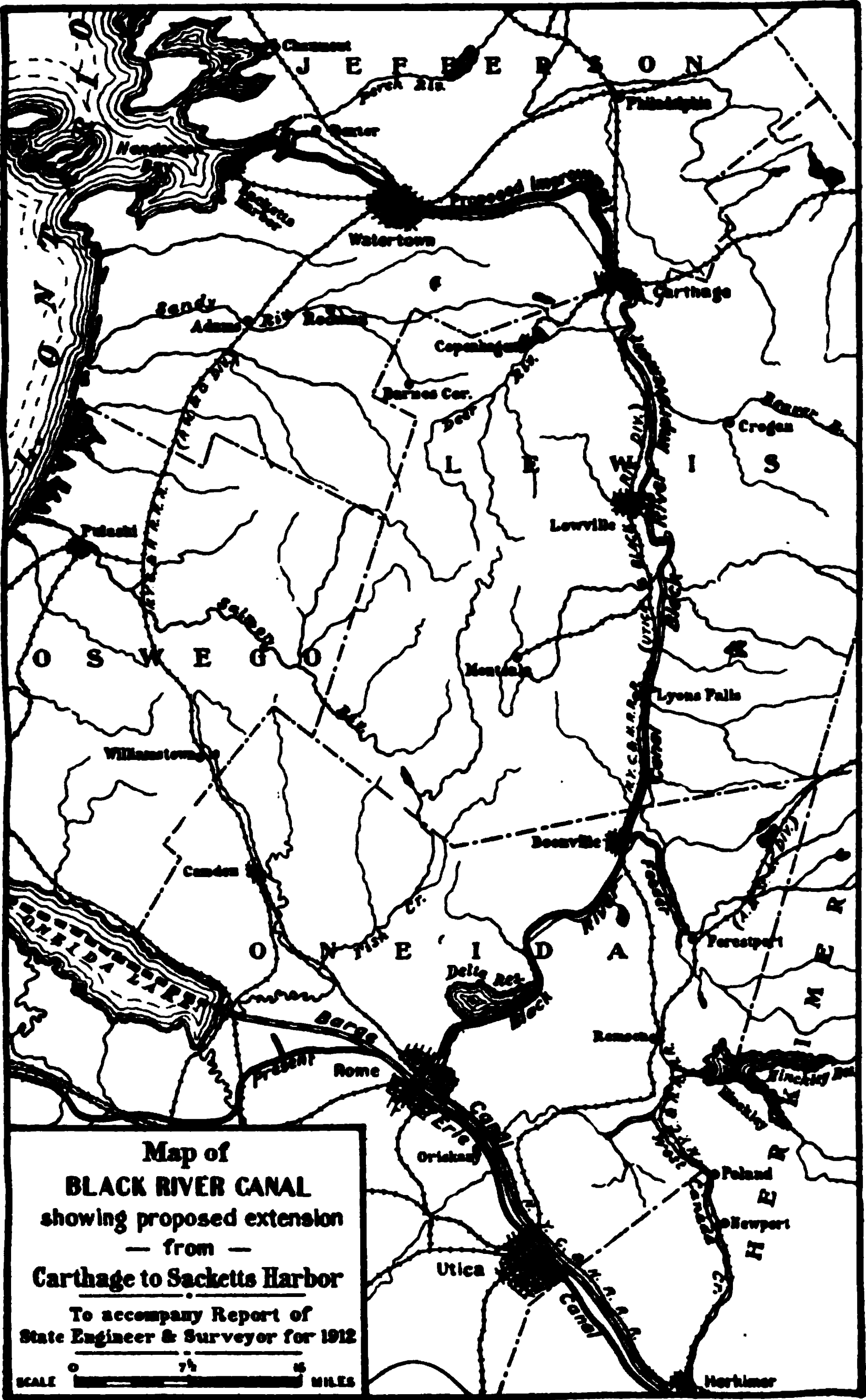
The report of the Barge Canal Terminal Commission made in 1911 and the Barge Canal Terminal Law authorizing the construction of terminals in connection with the Barge canal system does not take into consideration or definitely provide for the construction of Barge canal terminals at points along the Hudson river between Albany and New York, which has become a part of

the Barge canal system of the State, and the attention of the Legislature is called to this condition, to the end that the matter may be given consideration, inasmuch as it will undoubtedly be necessary to obtain an additional appropriation in order to provide for the construction of terminals at the various points along the Hudson river between Albany and New York city.

BLACK RIVER SURVEY.

By Chapter 190 of the Laws of 1911 the State Engineer was directed to make a survey of and to prepare plans and estimate for improving the Black river for navigation, between the State dam at Carthage and Sacketts Harbor on Lake Ontario. A partial report of this survey was appended to my report of a year ago. During the year the work has been completed and a full report has been prepared. This report will be found among the appendices of my present report.

A study of the accompanying map and of the details of work done will show that all feasible routes between Carthage and Sacketts Harbor have been investigated. Not only has the line along the river, together with possible short deviations and cut-offs been studied, but the survey has included lines along valleys lying several miles distant. The report gives the summaries of length and estimated cost of each separate portion of all lines surveyed, so that the results of various combinations can readily be determined. The most feasible route appears to be as follows: Beginning at Carthage the Black river is utilized to within a short distance of Deferiet. Then comes a cut-off to the east of this village, till the river is regained a little to the north. From this point to the eastern end of Huntington island, just east of Watertown, the river is used, with the exception of a cut-off across a bend at Black River village. The river channel is used around the north side of Huntington island and then a land line is followed which extends along the northern outskirts of Watertown, passing, near its western end, into Cowans creek and entering Black river at the mouth of this creek, a point which is opposite the fair grounds. Then the river is again utilized to Glen Park, where a line to the south of the river is begun, which runs to the headwaters of Muskalonge creek and then follows this stream to



its entrance into Lake Ontario through Muskalonge bay, which is an indentation some three miles from Sacketts Harbor.

A summary of the cost along this route is, in round numbers, \$16,300,000. This is for a canal having prism and locks of the same size as the Barge canal improvement. If smaller locks (28 feet wide by 188 feet long between gates) be substituted, but retaining the same size of prism, the estimate becomes \$14,600,000.

BRIDGE OVER THE MOHAWK RIVER.

Last year the attention of the Legislature was called to the fact that unless an appropriation was made for a bridge or bridges spanning the canalized Mohawk river at some point or points between Cohoes and Schenectady, there would be no means for highway traffic to cross the river between these points, upon the completion of the Barge canal. Bills were introduced in the Legislature in accordance with the recommendation of last year, but failed to become laws. During the present winter it is planned to remove one of the bridges over the river within this stretch, and in a short time the condition above mentioned will prevail, unless some provision is made to relieve this situation. The recommendation of last year is therefore renewed, that an appropriation be made for constructing such bridge or bridges as are necessary over the canalized Mohawk river at such point or points between Cohoes and Schenectady as the demands of traffic warrant. Specific appropriations should be made for such purposes, inasmuch as the construction of such bridges was not contemplated in the original Barge Canal Act, and I am personally opposed to the placing upon the funds appropriated for Barge canal purposes additional burdens for structures not contemplated in the original appropriations, but which conditions that have developed since the enactment of the original canal laws have made necessary.

MAPPING CANAL LANDS.

The Legislature of 1912 appropriated \$10,000 for continuing the work of making surveys of lands along the canal embraced in what is commonly called the "blue line." During the past year this work has been continued and maps prepared covering such territory as has been surveyed. These maps are of impor-

tance at the present time in determining the definite boundaries of the State canal lands, and will be of more importance upon the completion of the Barge canal in the event of the State taking some action toward the disposal of such lands as will no longer be needed in connection with the canal system. The appropriation made by the Legislature of 1912 was not sufficient to provide for continuing this work as rapidly as was deemed advisable, and such appropriation has been totally exhausted. In order that additional field parties may be placed on this work and the final maps showing the State property completed at the earliest possible date, it is recommended that an appropriation of \$35,000 be made for this purpose.

CANAL EXHIBITS.

The past year has shown an increasing popular interest in the Barge canal. A few words may be said in describing what has been done to supply information to those who have manifested this interest.

For several years various State departments have made exhibits at the State Fair, the Legislature having made appropriations for this purpose. The State Engineer's department has been among the leading State exhibitors and has in this way become possessed of some very interesting materials for exhibition — such as models, maps, drawings, paintings, cabinets of photographs, lantern slides and motion picture films. The models especially have been very instructive, as they are workable and represent graphically portions of the canal or its structures.

That the exhibit has been appreciated is proved by the fact that during the year various portions of it have been shown at six expositions or conventions, upon the earnest solicitation of those having these affairs in charge. These occasions have included the International Navigation Congress at Philadelphia, the Atlantic Deeper Waterways Convention at New London, the State Fair at Syracuse, two expositions at New York and one at Pittsburgh. At the conventions at Philadelphia and New London lectures on the Barge canal were delivered, while at Syracuse, in lieu of a lecture, a plan was adopted of showing upon a screen in continuous succession motion pictures of canal operations.

Of a somewhat similar character has been the attendance of representatives of the department at two other conventions — the State Waterways Association at Watertown and the National Waterways Association at Washington — to read papers on Barge canal topics.

Upon several occasions also lectures on the canal have been delivered in various parts of the State before educational institutions, business associations and engineering or other technical or social clubs.

The passing of two excursion parties, composed largely of representatives of foreign governments, over the line of the canal, have indicated the extent of interest in our great undertaking beyond the limits of the home country. These parties occupied special excursion trains and evinced much interest in the work being carried on. Representatives of the State Engineer's department who accompanied them and others who met them at the various stopping places acted as personal guides to explain the details of the project.

STATE HIGHWAY COMMISSION.

By legislative enactment of 1911, the State Highway Commission was constituted, to be composed of the Superintendent of Highways (appointed by the Governor), the Superintendent of Public Works, and the State Engineer and Surveyor. A report by this Commission will be made at a later date. The form of this Commission was one different than any which I have knowledge of having been formed for constructive purposes. Two members of the Board are in an advisory capacity and in one member of the Board, the Highway Commissioner, is vested practically the entire control.

At no time have I been in favor of this method of executing work, and in order to properly take up the matter of the additional work under the authorization by the people for the additional \$50,000,000 for road improvement, it is my opinion that the method of organization should be changed and the Highway Commission put in control of the work as a Commission, or that it be placed under a single head. In any event, it is my opinion that so much work is at present put upon the State Engineer in

the various boards of which he is a member and in the execution of the work in the improvement of the State's canal system that it is not possible for him to attend to the work required in the Department of Highways.

STATE BOUNDARY LINES.

Chapter 59 of the Laws of 1909, Consolidated Laws, places upon the State Engineer and Surveyor the duty of examining the boundary lines of the State of New York at certain stated periods and, in coöperation with the adjoining states, to replace such monuments as may have been damaged or destroyed. The total length of the boundary line of the State of New York is 1,416 miles, such boundary being divided as follows:

Canadian line, 431 miles; Pennsylvania line, 344 miles; New Jersey line, 92.5 miles; New Jersey around Long Island, 246 miles; Connecticut, to Long Island sound, 81 miles; Massachusetts line, 50.5 miles; Vermont line, 171 miles.

The Canadian, Massachusetts, Vermont and Pennsylvania lines were in satisfactory condition at the time of last examination made by representatives of the State Engineer and Surveyor. For several years an effort was made to have the State of Connecticut coöperate with the State of New York in remonumenting and relocating the boundary line between Connecticut and New York, but until 1908 no definite arrangement had been made. As a result of an agreement entered into between the State Engineer and Surveyor on the part of the State of New York and the representatives of the State of Connecticut the work necessary in remonumenting the Connecticut line has been carried on and was finally completed in 1912. The maps and description showing such remonumented boundary line were submitted to the Legislature of 1912 and approved and the original copies filed in the office of the Secretary of State. Duplicate originals of these maps and descriptions will be submitted to the Legislature of the State of Connecticut for approval at their session of 1913.

The attention of the Legislature is called to certain discrepancies which occurred in the final draft of the bill approving the description of the New York-Connecticut line, and it is therefore

recommended that chapter 352 of the Laws of 1912 be amended in the following respects, in order that the description as defined in this act shall be in conformity with the boundary line as actually laid out and monumented:

In the description defining the location of Monument 18 the longitude should be " $73^{\circ} 29' 49.318''$ " rather than " $73^{\circ} 29' 49.316''$ "; the longitude of Monument 45 should be " $73^{\circ} 31' 01.335''$ " rather than " $73^{\circ} 31' 01.535''$." The bearing of the course from Monument 48 should be "South $3^{\circ} 31' 33''$ west" rather than " $3^{\circ} 31' 35''$ west."

An examination of the New Jersey boundary line has been made during the past year, and it is found that several of the monuments have been totally destroyed and that others are greatly in need of repair. It is estimated that the cost of restoring such monuments as have been destroyed and of repairing the damaged monuments will be \$3,500, one-half of the expense of which is to be borne by the State of New York and one-half by the State of New Jersey.

Detailed report of the examination of 1912 is appended hereto.

During the coming year an examination should be made of the boundary line between the State of New York and the State of Pennsylvania.

It is recommended that for the purpose of defraying the expense necessary in making repairs to the New Jersey line and making an examination of the Pennsylvania line an appropriation of \$3,000 be provided.

COÖPERATIVE SURVEY OF NEW YORK STATE.

Topographic Survey.

Pursuant to the agreement between the State of New York and the United States Geological Survey, an appropriation was made by the last Legislature for continuing the coöperative topographic survey of the state of New York. The maps prepared as a result of such coöperative survey are of great value to the people at large, and particularly so to certain of the State departments, such as the State Engineer's Department, the State Highway Commission, the Conservation Commission, and the Public Service Commission. These maps show all the highways, streams,

railroads and particular topographic features of the territory embraced in the different quadrangles.

In accordance with the agreement signed by George Otis Smith, Director of the United States Geological Survey, and by me as State Engineer and Surveyor for the State of New York, the Federal Survey allotted \$10,000 to meet the appropriation of \$10,000 made by the State of New York in 1912 for continuing this work. The following is a summary of the field and office work accomplished during the past year under the general direction of R. G. Marshall, Chief Geographer, and under immediate supervision of Frank Sutton, Geographer of the Atlantic Division.

The area embracing the state of New York has been divided into 260 quadrangles of which 222 had been surveyed prior to January 1, 1912, representing the topography of 42,374 square miles, and there was partially mapped 66 square miles on two of the survey sheets. To the end of the present year there have been surveyed and mapped 225 quadrangles, representing the topography of 43,024 square miles. These topographic maps are published by the United State Geological Survey and may be obtained by making application for the same upon payment of the cost for publication.

There is attached hereto an index map showing the sections of the state for which topographic maps have been published, those sections for which surveys have been started, and those upon which no work has as yet been done.

This work is considered one of the most important to the people at large, and in order that this work may be continued during the coming year it is recommended that the usual appropriation of \$10,000 be made for the coöperative topographic survey of the state of New York, the Federal Government making an allotment of an equal amount to be applied to this purpose.

Hydrographic Survey.

During recent years it has been customary for the Legislature to make a small annual appropriation for carrying on a hydrographic survey of the state, coöperatively with the Federal Government. This work is of considerable importance, not alone to this Department but also to the Conservation Commission and

other State departments and to interested municipalities and companies. In recent years the necessity of conserving natural resources is being emphasized. Water power is one of the natural resources that has largely been wasted in this country. As the work of the hydrographic survey consists chiefly in securing data which are essential in planning to utilize our water resources, its importance is easily seen.

For Barge canal purposes this coöperative work was not sufficient and it was necessary to establish a hydrographic bureau in connection with the canal improvement. The records obtained by the coöperative survey, by the Barge canal hydraulic bureau, by the Conservation Commission, the Board of Water Supply of New York City and various private companies and individuals, are all combined to form the printed report of the State Engineer on hydrographic work, and the report thus becomes almost a complete account of such work in the state.

I recommend that the usual amount, \$1,500, be appropriated this year.

POLLUTION OF BARGE CANAL WATERS.

In my report of a year ago I called attention to the need of adequate legislation for preventing the pollution of the waters of the State canal system. No enactments were passed to relieve the situation, but the need of speedy action has become more apparent. In prosecuting Barge canal construction during the year it has been necessary in a few instances to cut off sewers that had emptied into the canals. If it had been possible for the proper authorities to require the installation of suitable sewage disposal plants at the localities affected by these interferences, an undesirable condition would have been avoided.

In view of the fact that the present public health statutes are inadequate to correct existing conditions, as was pointed out in my last annual report, and because the approaching completion of the Barge canal makes haste imperative, I renew my recommendation of a year ago — that suitable laws be enacted at once — the precise form of such legislation to be determined by conference between the officials interested — the Superintendent of Public Works, the State Engineer and Surveyor and the Commissioner of Health.

SURVEYS FOR ATTORNEY-GENERAL.

In the defense of claims against the State it is necessary for the Attorney-General to have prepared surveys and maps and to be furnished with certain technical data, in order to properly present the State's side of the case before the courts.

In all matters pertaining to claims on account of the canal operation or construction the State Engineer is called upon by the Attorney-General to prepare such surveys, maps and reports. This work has been conducted during the past year in a manner similar to that of previous years, and as claims are continually being filed against the State in canal matters other than Barge canal construction, it is necessary that funds be provided for defraying such expenses as may be incurred in preparing this information for the Attorney-General.

It is therefore recommended that an appropriation of \$5,000 be made for this purpose, which is similar to that made by the Legislature in former years.

SURVEYS FOR STATE DEPARTMENTS AND COMMISSIONS.

During the past year the State Engineer has from time to time, upon request from other State departments and commissions, made surveys and prepared necessary maps. In the making of such surveys and maps certain expenses are necessarily incurred for which it has been the custom of the Division Engineers to make advances. In several instances the State Engineer has been compelled to wait for a considerable length of time before obtaining reimbursement for such moneys advanced, and at the present time this Department has an account against another State department which has been overdue for more than one year.

Pursuant to the provisions of the Canal Law the Division Engineers are placed under bonds, and it is not a just nor proper condition to require that they should be called upon to make advances for such expenses.

My recommendation of last year is therefore renewed, that some provision be made by the Legislature whereby there shall be placed in the hands of the State Comptroller a fund of at least \$5,000, against which drafts may be drawn by the State Engineer for temporary payment of engineering expenses incurred for the

purposes above mentioned, the amount of such expenses to be refunded, by that branch of the State government for which the work was performed, to this fund under the jurisdiction of the Comptroller in such manner as may be prescribed by the Legislature or determined by the State Comptroller.

FIRE-PROOF DEPOSITORIES FOR STATE RECORDS.

For several years the subject of providing fire-proof vaults for valuable records in the offices of the State Engineer's Department has been brought to the attention of the Legislature. Only once has favorable action been taken. A small appropriation in 1910 placed fire-proof cabinets and vaults in the Syracuse Weigh-lock building, which is occupied by division offices of the departments of the State Engineer and the Superintendent of Public Works. No provision has yet been made for the Division Engineers' offices at Albany and Rochester nor for the State Engineer's office. There are many smaller offices at numerous places throughout the state, but these are generally provided with safes which, while not affording full protection, will probably suffice. The main offices, however, where records are filed permanently should have full protection against loss by fire.

The need for prompt provision is more imperative than ever. With every passing year the records become more valuable and another great loss of irrecoverable State treasures should not be required to incite to action. Even the contemplated removal of the State Engineer's office to another building need not delay the providing of fire-proof cases which may be transferred with the other office furniture. Accordingly I recommend that an appropriation be made for partial if not for full fire-proof equipment.

APPENDED REPORTS.

To show in greater detail the work of the year, reports of engineers in charge of the various pieces of work are added as appendices to my report.

Engineering Expenses: Contract Work.

First are tables giving summaries of the engineering expenses of the Department for the fiscal year. The details that make up

these summaries are contained in the reports of the three Division Engineers and the Terminal Engineer. Next follow tables of contracts that have been completed during the year, and then others of the contracts that are in force at its close.

Barge Canal Terminals.

The preparation of plans and the inspection of construction work as authorized by the Barge Canal Terminal Act has been placed in a bureau in charge of the Terminal Engineer. The detailed report of the Terminal Engineer, which is appended hereto, shows what has been accomplished in connection with providing Barge canal terminals for the canal system.

Division Reports.

The Division Engineers in charge of the three divisions into which the state is divided have each made a report of all of the work performed under their respective supervisions. For Barge canal construction each division has been divided into residencies, which are in charge of Resident Engineers. The reports of the Resident Engineers to the Division Engineers furnish the accounts of what has been done during the year in the actual construction of the canal.

Testing Laboratory for State Works.

The account of what has been done in the Testing Laboratory is contained in a report of the Resident Engineer in charge of these tests.

For many years a testing laboratory has been maintained as a part of the State Engineer's Department, and for many years this laboratory has stood in the front rank among testing laboratories in the land. While the testing of cement constitutes the chief work of the laboratory, the great structures on the Barge canal have occasioned the necessity of testing sand also, and several years ago this work was added. In this laboratory not only is the cement tested that is used for public works supervised by the State Engineer, but also that used in the buildings erected under the State Architect's direction. When the work on highway improvement was in charge of the State Engineer, apparatus for

testing stone was placed in the laboratory. These appliances have been transferred to the Highway Department, but cement for highway construction is still tested in this laboratory, though at the expense of the Highway Department.

With the advent of the Barge canal came the use of cement in such large quantities that the custom of inspecting and sampling at the mill was instituted, and this has become an important branch of the work of the laboratory.

Land Bureau.

The report of the engineer in charge of the Land Bureau of the State Engineer's Department is also appended.

This is the bureau which has charge of the sale of State lands and of the custody of ancient maps and records. There are many ancient records and some modern ones on file in this bureau that are of great value. Occasionally it is possible to add material of considerable value to this collection and whenever this can be done without cost to the State, it has been done. This bureau is maintained by the State Engineer in connection with his membership as one of the Commissioners of the Land Office. The Commissioners generally refer matters pertaining to the examination of maps to the State Engineer and for this purpose a small fund is needed. Accordingly I recommend the appropriation of \$1,000.

Bureau of Hydraulics.

The report of the engineer in charge of the Bureau of Hydraulics is added as an appendix, but is printed in a supplemental volume. This custom is followed because it permits an earlier publication of the remaining portions of the report. The records which comprise the hydraulic report are of great value for reference. If this separation were not made, the time required in compiling, computing and publishing the hydraulic tables would delay the whole report.

There has been a Bureau of Hydraulics in the Barge canal office since 1906. In addition to the gaging of the flow of streams—the work which furnishes the chief subject of the annual report of the bureau—the duties of the bureau include the investigations and reports on special hydraulic problems in

connection with Barge canal construction and the preparation of defense for the State in hydraulic and similar cases before the State Board of Claims.

To complete the published report the gagings taken by the hydraulic bureau are supplemented by those taken coöperatively by the State and the United States Geological Survey, by those furnished through the courtesy of the State Conservation Commission and the Board of Water Supply of the city of New York and by others obtained from various corporations and individuals.

Other Reports.

Three other reports will be found among the appendices.

One describes the Black river survey, concerning which something has already been said.

Another records the results of an examination of the New York-New Jersey boundary line. This subject also has been discussed.

The other reports the work done by the State in coöperation with the United States Geological Survey in making topographic surveys of the State. Concerning this matter also I have had something to say.

ACKNOWLEDGMENT.

Acknowledgment should be made to my Deputies and Division Engineers for faithfulness in assisting me to carry on the work of the Department.

During the latter part of the year Mr. Arnold G. Chapman has served as Deputy State Engineer, while during the whole year the Barge canal has been in charge of Mr. Alexander E. Kastl, and the terminal work under the supervision of Mr. John A. O'Connor. Mr. Dwight B. La Du has been at the head of the Eastern Division; Mr. Edwin Styring of the Middle Division, and Mr. Edward J. Govern of the Western Division.

Respectfully submitted,

J. A. BENSEL,

State Engineer and Surveyor.

**Engineering Expenses for the Fiscal Year Ended
September 30, 1912**

**Table of Contracts Completed During the Fiscal Year
Ended September 30, 1912**

Table of Contracts Pending September 30, 1912

**Roster of Employees in Office of State Engineer
and Surveyor**

Engineering Expenses for Fiscal Year Ended September 30, 1912.

Ordinary Repairs to Canals.

WORK.	ACT.		Division.	Amount.	Total.
	Chap.	Year.			
Erie canal.....	810	1911	Eastern....	\$7,289 81	\$12,000 00
Champlain canal.....	810	1911	Eastern....	4,710 19	
Erie canal.....	810	1911	Middle.....	\$9,012 16	9,250 00
Black river canal.....	810	1911	Middle.....	237 84	
Erie canal.....	810	1911	Western....	\$8,927 59	8,927 59
Total.....	.....	.....	.....	.....	\$30,177 59

Construction of Barge Canal.

WORK.	ACT.		Division.	Amount.	Total.
	Chap.	Year.			
Head office account.....	{ 147 82	{ 1903 1912	Eastern....	\$306,222 72	\$645,300 96
Erie canal.....	{ 147 82	{ 1903 1912	Eastern....	214,103 45	
Champlain canal.....	{ 147 82	{ 1903 1912	Eastern....	124,974 79	
Erie canal.....	{ 147 82	{ 1903 1912	Middle.....	\$169,252 95	311,033 04
Oswego canal.....	{ 147 82	{ 1903 1912	Middle.....	87,238 15	
Cayuga and Seneca canal.....	{ 391 214 339	{ 1909 1911 1911	Middle.....	54,541 94	
Erie canal.....	{ 147 82	{ 1903 1912	Western....	\$265,360 35	265,360 35
Total.....	.....	.....	.....	.....	\$1,221,694 35

Bureau of Bridges.

WORK.	ACT.		Division.	Amount.	Total.
	Chap.	Year.			
Bureau of bridges.....	811	1911	Eastern....	\$806 39	\$806 39

Special Work.

WORK.	ACT.		Division.	Amount.	Total.
	Chap.	Year.			
Vliet street bridge, Cohoes.....	488	1912	Eastern....	\$510 67	\$3,902 17
Building dikes, Delaware river at Port Jervis.....	537	1912	Eastern....	483 44	
Construction of docks at port of New York.....	547	1912	Eastern....	79 90	
Minisongo bridge pier.....	513	1910	Eastern....	37 48	
Improvement of Mohawk river and West Canada creek.....	132	1911	Eastern....	2,790 68	
Franklin street bridge, Syracuse....	{ 453 1909 } 527 1910		Middle.....	\$1,416 37	3,533 25
Washington street bridge, Rome...	522	1910	Middle.....	104 00	
Dominick street bridge, Rome.....	877	1912	Middle.....	1 080 64	
Improvement of Weigh-lock building, Syracuse.....	524	1910	Middle.....	932 24	
Repairs to Oak Orchard feeder....	547	1912	Western....	\$611 07	
Repairs to drain at Chapel street, Lockport.....	397	1912	Western....	55 00	666 07
Total.....	\$8,101 49

Special Surveys.

WORK.	ACT.		Division.	Amount.	Total.
	Chap.	Year.			
Surveys, field notes and manuscript maps.....	{ 199 1910 } 511 1912		Eastern....	\$10,622 51	\$25,962 78
State Board of Claims surveys.....	{ 433 1909 } 513 1910		Eastern....	209 28	
Examination of monuments and maps.....	513	1910	Eastern....	496 85	
Topographic survey.....	{ 811 1911 } 547 1912		Eastern....	12,732 38	
Hydrographic survey.....	{ 811 1911 } 547 1912		Eastern....	1,901 76	
State Board of Claims surveys.....	{ 513 1910 } 811 1911		Middle.....	\$3,520 85	16,638 62
Mapping canal lands.....	199	1910	Middle.....	3,251 19	
Surveys, field notes and manuscript maps.....	511	1912	Middle.....	1,270 53	
Black river survey.....	190	1911	Middle.....	8,596 05	
State Board of Claims surveys.....	811	1911	Western....	\$1,679 88	
Surveys, field notes and manuscript maps.....	511	1912	Western....	3,496 92	5,176 80
Total.....	\$47,778 20

Construction of Barge Canal Terminals.

WORK.	ACT.		Division.	Amount.	Total.
	Chap.	Year.			
Head office account.....	746	1911	.....	\$23,852 43	\$23,852 43
Eastern division account.....	746	1911	Eastern....	20,353 29	20,353 29
Southern division account.....	746	1911	Southern....	20,056 92	20,056 92
Middle division account.....	746	1911	Middle.....	23,309 88	23,309 88
Western division account.....	746	1911	Western....	14,152 82	14,152 82
Total.....	.....	.....	.....	\$101,725 34	\$101,725 34

Summary of Engineering Expenses for the Fiscal Year Ended September 30, 1912.

DIVISION.	Ordinary repairs to canals.	Construction of Barge canal.	Bureau of bridges.	Special work.	Special surveys.	Construction of Barge canal terminals.	Total.
Eastern and head office.	\$12,000 00	\$645,300 96	\$806 39	\$3,902 17	\$25,962 78	\$44,205 72	\$732,178 02
Middle.....	9,250 00	311,033 04	.....	3,533 25	16,638 62	23,309 88	363,764 79
Western.....	8,927 59	265,360 35	.....	666 07	5,176 80	14,152 82	294,283 63
Southern.....	.....	.....	.....	.....	.....	20,056 92	20,056 92
Totals...	\$30,177 59	\$1,221,694 35	\$806 39	\$8,101 49	\$47,778 20	\$101,725 34	\$1,410,283 36

TABLE OF CONTRACTS COMPLETED DURING THE FISCAL YEAR ENDED SEPTEMBER 30, 1912.
Special Work.

CONTRACTOR.	Date of contract.	Character of work.	Division.	ACT.		Appropriation.	Engineer's preliminary estimate.	Contract price.	Final payment.
				Chap.	Year.				
E. S. Eickles	April 28, 1911	Reconstruction of the center pier (protection pier) of the draw bridge over Minisseeongo creek, Rockland county	Eastern ..	513	1910	\$5,000 00	\$4,461 00	\$4,485 00	\$4,731 03
Charles B. Foster	Dec. 3, 1910	Franklin street bridge, Syracuse	Middle ..	527	1910	\$1,000 00	\$1,131 75	\$5,245 75	\$7,112 27
The O. M. Edwards Co.	Nov. 16, 1911	Wagh-lock building, Syracuse	Middle ..	524	1910	\$5,000 00	\$9,817 40	\$9,231 50	\$11,673 96

Special Work, Connected with Barge Canal Construction.

CONTRACTOR.	Date of contract.	Character of work.	Division.	Engineer's preliminary estimate.	Contract price, as affected by alterations.	Final payment.
Cunningham-Woodard Co.	June 15, 1910	Highways adjacent to Delta reservoir	Middle ..	1909	\$46,386 80	\$45,314 70
Cunningham-Woodard Co.	June 15, 1910	Raising highway adjacent to contract No. 78, near Fulton	Middle ..	1909	\$15,419 90	\$16,733 56

Construction of Barge Canal.
Chapter 147, Laws of 1903, and amendatory laws.

TABLE OF CONTRACTS COMPLETED.

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CONTRACTOR.	Date contracted.	Engineer's preliminary estimate.	Contract price, as affected by alterations.	Final payment.
E. J. Doyle & Co.....	Dec. 8,	\$1,353 10	\$1,350 92	\$1,353 14
F. A. Macelli.....	May 3,	1,331,662 50	1,028,549 80	1,033,864 04
Thos. Crimmins Contracting Co....	Mar. 18,	724,014 00	803,397 18	655,461 19
Thomas F. Riley.....	Nov. 26,	533 00	723 80	628 80
Atlantic, Gulf & Pacific Co.....	Aug. 9,	1,380,760 00	1,481,891 75	1,378,956 17
Pean Bridge Co.....	Jan. 7,	163,618 80	175,537 40	165,183 48
J. D. Miller	May 25,	72,000 00	46,800 00	46,800 00
Kalk & Brown.....	Nov. 3,	8,190 50	7,560 00	7,526 25
Shanley-Morrissey, Inc.....	Nov. 23,	1,175,623 00	1,024,281 85	946,167 98
E. M. Graves	May 26,	778,900 00	518,828 96	517,223 70
Cunningham-Woodard Co.....	Aug. 18,	55,184 00	49,025 95	50,068 19
Lapier & Remick.....	Sept. 23,	39,725 00	37,480 00	33,979 58
Walter Bradley.....	Jan. 16,	134,340 00	117,360 64	110,886 34

TABLE OF CONTRACTS PENDING, SEPTEMBER 30, 1912.
Special Work.

CONTRACTOR.	Date of contract.	Character of work.	Division.	Act.		Appropriation.	Engineer's preliminary estimate.	Contract price, as affected by alterations.	Value of work done to September 30, 1912.
				Chap.	Year.				
Lathrop, Shea and Henwood Co.....	Oct. 31, 1911	The in the land and banks of Canada creek at F	Eastern....	132	1911	\$75,000 00	\$66,500 00	\$49,430 00	\$40,230 00
Aldrich & Hall, Inc.	July 23, 1912	Const canal at Viet street, Cohoes over the Erie	Eastern....	488	1912	7,000 00	5,130 00	5,710 30	4,000 00
Lupfer & Remick.	July 24, 1912	Constructing a highway bridge over Black river canal at East Dominick street, Rome, Middle....	Middle....	877	1911	.....	22,700 50	19,874 00	207 00

Special Work, Connected with Barge Canal Construction.

CONTRACTOR.	Date of contract.	Character of work.	Division.	Act.		Engineer's preliminary estimate.	Contract price, as affected by alterations.	Value of work done to September 30, 1912.
				Chap.	Year.			
Henry P. Burgard	Jan. 3, 1912	Road A, adjacent to contract No. 37.....	Middle....	13	1909		\$4,620 00	\$680 00
Henry P. Burgard	Jan. 3, 1912	Road B, adjacent to contract No. 37	Middle....	13	1909		\$3,019 50	70,350 00
James Stewart & Co	Aug. 14, 1912	Ox creek highway, near Fulton	Middle....	13	1909	\$73,000 00	\$0,228 50	3,500 00

Construction of Barge Canal.

Chapter 147, Laws of 1903; Chapter 391, Laws of 1909; and amendatory laws.

CONTRACTOR.	Date of contract.	Division.	Engineer's preliminary estimate.	Contract price, as affected by alterations.	Value of work done to September 30, 1912.
Empire Engineering Corporation....	April 18, 1905 ^a	Eastern.....	\$619,846 00	\$580,423 57	\$474,400 00
Ferguson Contracting Co. s.....	April 3, 1905 ^a	Eastern.....	1,022,640 00	990,075 56	694,320 00
Holler & Shepard b.....	Dec. 8, 1909 ^a	Eastern.....	263,189 40	207,022 57	274,510 00
Sundstrom & Stratton	April 4, 1905 ^a	Eastern.....	760,576 00	657,273 09	633,290 00
James Stewart & Co. b.....	Jan. 20, 1912 ^a	Middle.....	395,235 00	317,507 00	239,980 00
Pittsburg-Eastern Co. s.....	May 22, 1906 ^a	Eastern.....	1,518,382 00	1,516,786 98	920,420 00
The Foundation Company b.....	July 6, 1912 ^a	Eastern.....	888,363 00	799,390 10	0
McDermott Contracting Co. a....	June 7, 1906 ^a	Middle.....	1,149,988 00	1,206,019,00	668,300 00
The T. A. Gillespie Co. b.....	Dec 14, 1911 ^a	Middle.....	103,088 00	174,513 90	88,800 00
Oswego Construction Co., Inc. b....	Mar. 4, 1912 ^a	Middle.....	515,044 00	516,236 00	76,240 00
Fort Orange Construction Co.....	May 21, 1906 ^a	Eastern.....	1,671,385 00	1,332,198 80	1,190,440 00
James Stewart & Co.....	Sept. 23, 1907 ^a	Middle.....	3,082,800 00	3,558,145 84	2,598,510 00
Penn Bridge Company.....	Nov. 7, 1908 ^a	Eastern.....	29,775 00	28,127 50	20,180 00
Acme Engineering & Contracting Co.....	Sept. 10, 1907 ^a	Eastern.....	2,675,570 00	2,985,224 72	2,325,480 00

^a Suspended by order of Canal Board.^b Relot to complete contracts.

TABLE OF CONTRACTS PENDING SEPTEMBER 30, 1912 — (Continued).
Construction of Barge Canal — (Continued).
 Chapter 147, Laws of 1903; Chapter 391, Laws of 1909, and amendatory laws.

CONTRACTOR	Date of contract.	Character of work.	Division.	Engineer's preliminary estimate.	Contract price, as affected by alterations.	Value of work done to September 30, 1912.
United Construction Co.	Dec. 20, 1908	canals — Bridges	Eastern	\$70,718 00	\$92,935 85	\$74,000 00
.....	Dec. 29, 1908	and locks at Am-	Eastern	\$83,928 00	\$42,417 68	\$7,500 00
.....	Mar. 3, 1908	at Springs guard-	Western	\$36,220 76	\$12,286 46	\$44,200 00
Co.	Nov. 26, 1908	crack	Eastern	1,038,245 00	\$91,401 16	\$49,000 00
.....	Aug. 20, 1909	crack — Lewis Falls to Castle	Eastern	499,000 00	\$90,837 30	\$99,420 00
S. Pearson & Son, Inc.	Aug. 2, 1909	Contract No. 20-B, Erie canal — Mohawk river, Minden-	Eastern	848,840 00	1,032,210 20	\$459,710 00
American Pipe & Construction Co.	Aug. 18, 1909	villes to Canajoharie	Eastern	\$70,000 00	\$85,720 00	\$94,190 00
American Pipe & Construction Co.	Aug. 18, 1909	Contract No. 20-C, Erie canal — Mohawk river, Cana-	Eastern	2,200,000 00	2,885,477 40	\$276,890 00
.....	Aug. 18, 1909	joharie to Yosta	Eastern	1,475,900 00	1,323,150 00	\$751,060 00
Lane Brothers Company.....	April 7, 1910	Contract No. 20-D, Erie canal — Mohawk river, Yosta	Western	107,126 00	127,521 00	40,500 00
.....	Sept. 24, 1910	to Rexford Flats	Middle	24,916 00	27,090 20	0
M. Fitzgerald ..	Aug. 8, 1912	Contract No. 21, Erie canal — Genesee river to near N	Western	2,108,000 00	1,824,388 60	1,024,280 00
.....	Aug. 18, 1909	Y. C. R. bridge	Eastern	48,092 00	44,368 00	19,510 00
Lupfer & Remick ..	Aug. 8, 1912	Contract No. 22, Erie canal — Bridges on part of con-	Eastern	1,849,631 00	1,707,191 80	1,525,500 00
Millard & Lupton Co.	Aug. 18, 1909	tract No. 12	Eastern	998,920 00	723,205 61	\$378,650 00
Kingsbury Construction Co.	Nov. 1, 1911	Contract No. 22-A, Erie canal — Bridge at Woodport	Eastern	409,455 00	486,484 25	\$211,370 00
Atlantic, Gulf & Pacific Co.	Nov. 19, 1908	Contract No. 23, Erie canal — Kings Bend to Genesee	Eastern	812,350 00	691,250 26	\$451,110 00
Kinsler Construction Co. a ..	Nov. 23, 1908	river	Eastern	2,650,500 00	2,600,400 87	\$1,523,150 00
Holler & Shephard b.	Dec. 1, 1910	Contract No. 24, Champlain canal — Guard-gate at	Eastern			
Maryland Dredging & Contracting Co.	April 3, 1909	Crocker's Reef	Eastern			
Acme Engineering & Contracting Co.	July 16, 1909	Contract No. 25, Champlain canal — Comstock to Dun-	Eastern			
		hams Basin	Eastern			
		Contract No. 27, Champlain canal — Dunhams Basin to	Eastern			
		Fort Edward	Eastern			
		Contract No. 27-A, Champlain canal — Dunhams Basin	Eastern			
		to Fort Edward	Eastern			
		Contract No. 29, Erie canal — Sterling creek to Her-	Eastern			
		kimer-Onondaga county line	Eastern			
		Contract No. 30, Erie canal — Mohawk river, Little Falls	Eastern			
		to Sterling creek	Eastern			

TABLE OF CONTRACTS PENDING.

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Casey & Murray.....	Sept. 2,	Little Falls.....	Eastern.....	813,800 00	931,202 26	744,040 00
Gilmour-Horton-Allen Co.....	Sept. 16,	Oswego.....	Middle.....	752,760 00	760,917 20	641,250 00
Henry P. Burgard.....	Dec. 9,	Fulton and iver Point to	Middle.....	1,992,220 00	2,462,606 70	1,137,930 00
James Stewart & Co. a.....	April 15,	.....	Middle.....	972,900 00	1,048,674 40	220,720 00
United Engineering & Contracting Co.....	Nov. 27,	Lockport to sells county	Western.....	2,516,743 00	2,252,143 80	1,738,530 00
Shanley-Morrisey, Inc. a.....	July 9,	ved to Mud	Middle.....	1,312,814 00	1,047,366 06	478,670 00
M. A. Talbott Co.....	Oct. 15,	to contract	Middle.....	1,539,885 00	1,413,015 90	301,340 00
Scott Brothers.....	Jan. 6,	s to Wayne	Middle.....	1,926,063 00	1,760,913 36	922,270 00
Kinzer Construction Co.....	Nov. 23,	a to Lyons	Middle.....	1,267,583 00	1,305,930 05	784,720 00
Crowell-Sherman-Stalter Co.....	Nov. 20,	C. & H. R.	Western.....	1,494,148 00	1,279,337 60	830,850 00
Crowell-Sherman-Stalter Co.	Dec. 20,	e R. R. cross-	Western.....	1,626,811 50	1,679,211 96	835,140 00
American Pipe & Construction Co.	Feb. 21,	Wayne-Mon-	Western.....	765,679 00	735,227 25	543,700 00
Buffalo Dredging Co.....	Sept. 23,	across West	Middle.....	1,076,000 00	971,768 00	233,860 00
Alto Construction Co.....	Dec. 23,	near Trenton creek ...	Middle.....	424,710 00	267,062 00	149,630 00
The Hunkin-Conkey Construction Co.	Dec. 13,	No. 7 at Fort	Eastern.....	232,906 00	251,370 10	194,150 00
Arthur McMullen.....	Oct. 19,	evour	Middle.....	1,014,525 00	945,530 56	882,350 00
Flood & Van Wirt Company ...	Sept. 26,	movement of	Eastern.....	317,636 00	319,906 20	0
New York State Dredging Co... ..	Aug. 6,	sondags lake	Middle.....	85,625 00	93,596 00	0
Empire Engineering Corporation... ..	Aug. 6,	hrees to near	Western.....	1,267,301 00	1,491,316 91	1,267,080 00
Cleveland & Sons Co.....	Oct. 13,	basin to Mon-	Western.....	1,000,219 00	1,060,553 35	861,870 00
I. M. Ludington's Sons, Inc.....	Aug. 11,	leaze county	Western.....	2,151,470 00	2,515,042 82	1,639,640 00
H. S. Karbaugh, Inc.....	June 3,	latos county	Western.....	2,184,083 00	2,349,697 46	1,421,190 00
Empire Engineering Corporation... ..	Aug. 6,	spect street,	Western.....	1,207,920 00	1,335,433 78	827,740 00
Empire Engineering Corporation... ..	Sept. 22,	to near locks	Western.....	751,039 00	854,303 59	764,240 00

b Relat to complete former contracts.

a by order of Canal Board.

TABLE OF CONTRACTS PENDING SEPTEMBER 30, 1912 — (Concluded).
Construction of Barge Canal — (Concluded).
 Chapter 147, Laws of 1903; Chapter 391, Laws of 1909; and amendatory laws.

CONTRACTOR.	Date of contract.	Character of work.	Division.	Engineer's preliminary estimate.	Contract price, as affected by alterations.	Value of work done to September 30, 1912.
Larkin & Sangster,	Sept. 3, 1910	Contract No. 67, Erie canal — Locks at Lockport	Western....	\$1,290,890 00	\$1,208,110 00	\$739,440 00
I. A. Hodge & Co., Inc.	Dec. 11, 1909	Contract No. 69, Champlain canal — Lock at lower Mechanicville,	Eastern....	270,675 00	240,206 45	210,850 00
Shanley-Morrissey, Inc. &	Jan. 11, 1910	Contract No. 70, Champlain canal — Hudson river, Waterford to lock No. 1.....	Eastern ...	749,300 00	779,836 50	236,240 00
Shanley-Morrissey, Inc. &	Jan. 11, 1910	Contract No. 1,	Eastern ..	1,502,100 00	1,561,119 00	821,960 00
Shanley-Morrissey, Inc. &	Dec. 14, 1909	Contract No. 1,	Eastern ..	1,439,733 00	1,221,111 75	618,900 00
United Construction Co.	Mar. 1, 1910	Contract No. 1,	Western....	39,625 00	42,917 00	40,980 00
The T. A. Gillespie Co.	Dec. 23, 1910	Contract No. 76, Erie canal — Near West Shore R crossing at East Newark to about one-half mile east of Port Gibson	Western....	1,504,776 00	1,512,011 15	790,870 00
The T. A. Gillespie Co.	Dec. 23, 1910	Contract No. 77, Erie canal — About one-half mile east of Port Gibson to about one-half mile west of Palmyra	Western....	1,790,672 00	1,701,807 55	1,176,270 00
Groton Bridge Co.	Dec. 7, 1910	Contract No. 82, Erie canal — Highway bridge super-structures within the limits of contract No. 21	Western....	27,235 00	28,841 60	21,320 00
Lupfer & Remick.....	Aug. 6, 1911	Contract No. 85, Oswego canal — Bridge over lock at Phoenix	Middle.....	12,783 50	13,151 50	12,010 00
Lathrop, Shea & Henwood Co. .	Sept. 23, 1911	Contract No. 86, Erie canal — Reconstruction of a por- tion of bridge at Canajoharie	Eastern....	41,871 00	43,440 00	4,940 00
Lathrop, Shea & Henwood Co. .	Nov. 4, 1911	Contract No. 88, Champlain canal — Reconstruction of a portion of bridge at Schuylerville,	Eastern....	23,553 00	29,642 00	7,280 00
Owego Bridge Co.	May 28, 1912	Contract No. 89, Erie canal — Construction of highway bridges between Lyons and Palmyra	Western....	65,116 00	59,616 00	0
D'Olier Engineering Corporation..	April 12, 1910	Contract No. 90, Erie, Champlain and Oswego canals — Power-supply at Baldwinsville, Smiths Basin, Con- stock and Whitehall; operating equipment at lock No. 24, Erie canal, at Nos. 9, 11 and 12, Champlain canal, and at Nos. 1, 2, 7 and 8, Oswego canal	Eastern.... } Middle..... }	180,630 00	180,317 94	168,890 00
Lupfer & Remick	Aug. 8, 1912	Contract No. 90-A, Oswego canal — Power-plants at locks Nos. 1, 2, 7 and 8	Middle....	64,840 00	64,020 20	980 00

TABLE OF CONTRACTS PENDING.

The Hollington Company.....	Jan. 5,	44,600 00	44,985 50	20,080 00
Barrally & Ingersoll.....	Aug. 8,	44,599 50	40,639 50	3,300 00
R. B. Murdock,	Mar. 5,			
Stene & Richmond.....	April 19,	45,580 00	38,370 00	590 00
Scott Brothers.....	Dec. 30,	253,010 00	246,710 00	30,620 00
Crowell-Sherman-Stalker Co.....	Dec. 29,	363,133 50	376,233 50	208,680 00
James H. Dawes.....	Dec. 22,	1,832,550 00	1,436,597 50	740,820 00
The Central Dredging Co.....	Sept. 23,	178,237 00	216,309 90	0
		304,330 00	215,639 00	0

a Suspended by order of Canal Board.

Roster of Employees in Office of State Engineer and Surveyor.

John A. Bensel, *State Engineer.*

Arnold G. Chapman, *Deputy State Engineer.*

R. V. Somerville, *Acting Chief Clerk.*

GRADED EMPLOYEES.

B. J. McAllister, *Private Secretary.*

M. Peckham, Jr., *Land Clerk.*

J. M. Smelzer, *Filing Clerk.*

Mabel Weinholz, *Stenographer.*

A. M. Flanigan, *Stenographer.*

Bertha Kirchner, *Stenographer.*

Henry MacFarlane, *Laborer.*

P. H. White, *Night Watchman.*

REPORT
OF THE
DIVISION ENGINEER
OF THE
EASTERN DIVISION

For the Fiscal Year Ended September 30, 1912

EASTERN DIVISION.

STATE OF NEW YORK,
DEPARTMENT OF STATE ENGINEER AND SURVEYOR,
EASTERN DIVISION.

ALBANY, *October 1, 1912.*

Hon. J. A. BENSEL, *State Engineer and Surveyor, Albany, N. Y.:*

Sir.— I have the honor to submit herewith my annual report as Division Engineer of the Eastern Division of the Department of the State Engineer and Surveyor, for the fiscal year ended September 30, 1912.

The work performed by the engineering force on this Division under my supervision consisted principally of the duties involved in connection with Barge canal construction. Plans and specifications have been prepared and construction superintended on various projects provided for by special legislation. The various State departments and commissions have been rendered the customary assistance in the way of preparing maps of the sites of their respective institutions. The Superintendent of Public Works has received detailed reports and testimony has been given, which he in turn has used in assisting the Attorney-General in preparing and defending claims which have been brought against the State of New York for damages arising from both Barge canal construction and the operation of the present canal system.

CONSTRUCTION OF BARGE CANAL.

(Chapter 147, Laws of 1903, and amendatory laws.)

This division includes that part of the Barge canal system that extends from the Troy dam west to the Herkimer-Oneida county line, on the Erie canal, and north to the southern end of Lake Champlain, which includes the entire length of the Champlain canal — in all, 190 miles of navigable waters. To fulfill the provisions and intent of the law passed by the Legislature, which gave

to the people of New York state the Barge canal system, it entailed the expenditure of over \$30,000,000 on this division, and inasmuch as the value of work completed on September 30, 1912, is practically \$18,500,000, it shows that the construction of the new canal within the limits of this Division is over 60 per cent completed. On the various sections which are now in a finished state and have been turned over to the Superintendent of Public Works, or are being operated by this Department in order that construction may be facilitated on uncompleted adjoining sections, the manner in which the several structures operate, fulfills the promises of their designers and reflects credit on the men who were in the field and in charge of their construction.

Several of the movable dams along the Mohawk river, which are now in a completed state, have been operated under the supervision of engineers from this Department, in order that a sufficient depth of water might be obtained that would allow the contractors to proceed with their dredging operations. The object has been accomplished, but the experience gained shows that too much importance cannot be placed in having men trained for this particular work located at every dam, as the manipulation of the gates in maintaining the proper water levels requires care and skill, and the failure of one of these dams would prove fatal, not only to construction in the vicinity, but at some future time, when the canal is completed, to its operation.

The work during the past year was progressed at a satisfactory rate, and had not the Canal Board been forced, due to lack of progress shown by the contractors, to cancel certain contracts which provided for dredging the Hudson river, the value of the work completed during the year would have compared very favorably, if not exceeded, that of any previous year.

MAPPING OF CANAL LANDS.

(Chapter 199, Laws of 1910.)

The work to be done as outlined in this act, which provided the funds for locating the limits of State property along the existing canals, which is commonly known as the "blue line," was progressed throughout the year until September 30, 1912, when it was

BAVUE CANAL, CONTRACT NO. 2-E.

Site of Barge canal entrance into the Hudson river at Waterford before the beginning of construction.

100
100
100

2000

2000

necessary to discontinue the work on account of lack of funds, the entire appropriation having been exhausted. The location has been completed and maps prepared and on file in this office, showing the location of the "blue line" along the old Erie canal from the Crescent aqueduct west to Fort Hunter. The field work has been completed from the Crescent aqueduct east as far as Cohoes. I strongly recommend that you petition the incoming Legislature for an appropriation for the continuing of this work, for such an amount that will allow the placing of more than one party in the field to continue this work, for as time goes on, the difficulty of locating the old corners and controlling points increases, and the Department is seriously embarrassed in not having any official maps which will be accepted by the courts as evidence as to the limitations of State property along the old canals.

THE MINISCEONGO BRIDGE PIER PROTECTION.

(Chapter 513, Laws of 1910.)

Plans and specifications were prepared by this Department for the reconstruction of the center pier protection of the draw bridge over the Minisceongo creek at Stony Point, Rockland county, New York. The contract was awarded to E. S. Sickles, and the work completed during the last year under the supervision of engineers from this Division.

IMPROVEMENT OF THE CHANNEL AND BANKS OF THE MOHAWK RIVER AND WEST CANADA CREEK, HERKIMER.

(Chapter 132, Laws of 1911.)

This act provides funds which will allow for certain improvements in the vicinity of the junction of the West Canada creek and the Mohawk river, in order that the village of Herkimer may be protected against floods which have menaced this locality every spring. Plans and specifications were prepared in this Department and the contract awarded to Lathrop, Shea & Henwood Co. for doing this work.

Since June, 1912, the construction under the supervision of engineers from this Division has progressed at a satisfactory rate, and it is expected that the contract will be completed and

the desired relief to the village of Herkimer obtained by January 1, 1913.

**CONSTRUCTION OF A HIGHWAY BRIDGE OVER THE ERIE CANAL AT
VLIET STREET, COHOES.**

(Chapter 488, Laws of 1912.)

This act provided for the removal of an existing bridge at Pittsford, N. Y., and its erection over the Erie canal at Vliet street, Cohoes. The necessary plans and specifications were prepared by this Department and the contract awarded to Aldrich & Hall, Inc. The construction has been completed under the supervision of engineers from this Division and the bridge thrown open to traffic.

**CONSTRUCTION OF DIKES ALONG THE DELAWARE RIVER AT PORT
JERVIS.**

(Chapter 537, Laws of 1912.)

Plans and specifications have been prepared by this Department to cover the construction provided for in this act, but the contract has not been advertised, inasmuch as the city of Port Jervis has not provided releases on all the lands that are necessary in making this improvement, and the act provides that these releases must be filed before the starting of any construction work.

PIER AT QUARANTINE STATION.

(Chapter 547, Laws of 1912.)

In the supply bill the Health Officer of the Port of New York is given certain funds for the construction of a new dock at the Quarantine station. This Department has prepared plans and specifications for this work, and bids have been received and it is expected that a formal contract will be signed, so that the construction will begin not later than December 1, 1912, and will be under the supervision of engineers from this Department.

SURVEYS FOR STATE DEPARTMENTS AND COMMISSIONS.

During the year surveys have been made and maps prepared for the following:

1890

1890

DAVID CANAL, CONTRACT NO. 2-E.
Completed channel at the entrance into the Hudson river at Waterford.

32

Saratoga Reservation Commission.

Maps have been prepared showing the boundaries of certain lands that it was the desire of the commission to purchase and add to the Saratoga reservation.

Training School for Girls at Hudson.

The necessary survey has been made and maps prepared of a plot of land to be purchased as an addition to the site of this school.

State Hospital Commission.

Maps have been prepared showing land to be purchased for the Hudson River State Hospital at Poughkeepsie.

Necessary surveys were made to locate the strip of land sold from the site of The Long Island State Hospital to the Long Island Motor Parkway for boulevard purposes.

Certain topographical surveys have been made at the site of the Mohansic State Hospital for the use of the State Architect.

Yorktown Training School for Boys at Yorktown Heights.

Additional surveys have been made at the site of this institution in order to give the State Architect certain information required in designing the buildings.

State Custodial Farm Colony, Dutchess Co.

Surveys have been made and the necessary maps prepared of lands that it is proposed to purchase as a site for this institution.

Health Officer of the Port of New York.

In order that the State Architect might have accurate information, a complete topographic map has been made, showing all buildings, etc., at Hoffman and Swinburne islands and at the Quarantine station on Staten island.

Attorney-General.

A survey has been made and map prepared of certain property situated in Ellenville, over which the Attorney-General is engaged in litigation.

Armory Commission.

A complete topographic map has been prepared, for the use of the State Architect, of the proposed site for the Troop B Armory at Albany.

In connection with all the above surveys it was necessary for me to advance moneys for both salary and expenses to the engineers from this Division, who were assigned to this work, it being understood that the department for which these several surveys were made are to reimburse this Department for the actual amount expended. In several cases considerable time has elapsed between the completion of the survey and the receipt of the money covering the cost thereof. This not only complicates the work of the financial department connected with this Division, but in carrying this balance, it in many cases renders it impossible to meet all the liabilities incurred at the proper time, as my bond now is hardly sufficient to cover the disbursements occasioned by the Barge Canal Act, and I cannot urge you too strongly to put forth your best efforts toward the passing of such legislation as would place \$5,000 in the hands of the Comptroller, upon which drafts can be drawn, covering the costs of these surveys at their completion, and the various departments for which the surveys are made may reimburse this fund at their convenience for the actual cost of the work performed.

I should also urge that the necessary legislation be recommended which will allow for the increase in my bond as Division Engineer of from \$50,000 to \$60,000, in order to facilitate the handling of the accounts.

Appended to this report are statements showing the engineering expenses and tables showing all contracts in force during the year, which are divided into two groups — those completed and those still pending,—together with detailed reports submitted by the various resident engineers, showing the progress of the work on their respective residencies.

In closing I desire to take this opportunity to express to you and Mr. Kastl my sincere appreciation for the courtesies which you have extended and the advice which you have given, that has so materially helped me in performing by duties as Division

Engineer; to make acknowledgment to my immediate office force for their painstaking efforts, and to the Resident Engineers and men engaged in the actual construction, to extend my hearty thanks for their loyalty and interest which they have shown in their work, and which made it possible for the Eastern Division to contribute her share to this record-breaking year of Barge canal construction.

Respectfully submitted,

D. B. LA DU,

Division Engineer.

APPENDED REPORTS — EASTERN DIVISION.

Resident Engineers' Reports on Barge Canal Construction.

ERIE CANAL, RESIDENCY No. 1.

Resident Engineer G. W. Stickney reports:

This residency covers that portion of the Erie canal between the Congress street bridge at Troy and the lower Mohawk aqueduct at the village of Crescent, a distance of 7.4 miles, and includes within its limits the following contracts upon which either preliminary or construction work has been in progress during the past year: Nos. 74, 2-E, 11, 91 and portions of Nos. 92, 33 and 16, besides several others that had been finished or suspended by the Canal Board prior to September 30, 1911.

The major part of the engineering work on this residency has had to do with the actual construction of the several contracts, but in addition to this a few cross-sections and rock soundings were taken at the Sloop lock, Troy, a revised preliminary survey was made for contract No. 74, work was continued on the mounted maps, several appropriations and reconveyance maps were made and final estimates for the several contracts worked up as follows: contract No. 2-E, 80 per cent completed; contract No. 11, 25 per cent completed; contracts Nos. 33 and 16, completed.

The following are detailed reports for the several contracts on this residency:

Contract No. 74.

For excavating a channel in the Hudson river and Mohawk river and performing work incidental thereto from Sta. 146 + 65 to Sta. 171 + 90. Length, 0.48 mile.

Plans are completed and approved by the Canal Board, but the contract is not yet awarded.

Contract No. 2-E.

For completing the construction of the canal from the Mohawk river at Waterford to a point about one-fourth mile above the head of lock No. 3. Length, 0.91 mile.

During the year operations have been confined chiefly to the sections of the contract below lock No. 2 and above lock No. 3, the

work between the locks having been practically completed during the previous year.

Below lock No. 2 the prism excavation has been finished and the embankment behind approach walls nearly so. The grading, concrete sidewalk, curb and cobblestone gutter for south approach to Fourth street bridge have been completed. The concrete docking which was substituted for cribbing by alteration No. 6 is 99.4 per cent completed and the short crib on the north side about 90 per cent finished.

There still remains to be placed in the north crib below lock No. 2, 1,200 lin. ft. of round timber, about 10,000 ft. B. M. of yellow pine in facing timber and fenders and 600 cu. yds. of stone filling; and on the south side: 1,000 ft. B. M. of yellow pine fenders, about 200 cu. yds. of embankment and 200 lin. ft. of wooden fence.

The only work done this year between the locks consisted in trimming up slopes and spoil banks and general cleaning up.

Above lock No. 3 all contract work done this year has been under alteration No. 7, which provides for a guide pier 820 ft. long on the south side. The work on this has been about 80 per cent completed, there still remaining 9 bridges to be built and the floating fenders to be framed and placed, requiring 144 cu. yds. of reinforced concrete, 26,000 lbs. of metal reinforcement, 5,000 lbs. of structural steel and 17,800 ft. B. M. of yellow pine timber.

The principal items of work done during the year are as follows:

Excavation	10,300 cu. yds.
Embankment	4,400 cu. yds.
Timber and plank (yellow pine)	33,400 ft. B. M.
Round timber in cribs	11,800 lin. ft.
Second-class concrete	1,364 cu. yds.
Stone filling in cribs.	1,170 cu. yds.
Foundation piles (alteration No. 7)	6,050 lin. ft.
Reinforced concrete (alteration No. 7)	284 cu. yds.
Metal reinforcement (alteration No. 7)	53,406 lbs.
Concrete dock wall (alteration No. 6)	\$16,290

Percentage of work done to date, based on the preliminary estimate, = 89.4.

BARGE CANAL. CONTRACT NO. 2-E.
Completed canal just below lock No. 3, at Waterford.

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The work on this contract will probably be completed early in November, 1912, at about 91½ per cent of the cost as computed from the preliminary estimate quantities.

Early in the spring the coffer-dams across the Champlain canal, at its intersection with the level of the new Erie canal just above lock No. 2, were removed, so that the level between locks Nos. 2 and 3 has been full during the entire season.

The work on contract No. 2-E has been under the direction of the following men: Oct. 1, 1911, to Jan. 20, 1912, G. W. Stickney, Asst. Eng.; Jan. 21, 1912, to May 31, 1912, H. P. O'Bryan, Leveler; June 1, 1912, to date, E. C. Hackett, Draftsman.

The following is a detailed statement of the totals and percentages of work done to date and during the fiscal year on each of the several items of this contract:

ITEMS OF WORK.	Preliminary estimate, as modified by alterations Nos. 1, 2, 3, 4, 5, 6 and 7.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
All excavation.....cu. yds.	142,488	10,264	118,254	7.3	83.7
Sheeting and bracing.....ft. B. M.	33,400	0	28,500	0	Finished
Forming embankment.....cu. yds.	67,975	4,392	55,220	6.3	81.3
Lining.....cu. yds.	770	0	754	0	Finished
Timber and plank, yellow pine.....ft. B. M.	144,900	33,400	112,900	23.2	77.9
Spruce, timber and plank.....ft. B. M.	1,000	0	900	0	Finished
Round timber in cribs.....lin. ft.	41,450	11,772	40,232	28.4	97.2
Foundation piles, 15 ft. long.....No.	2,015	0	1,451	0	Finished
Mooring piles, 20 ft. long.....No.	11	4	12	0	Finished
Second-class concrete.....cu. yds.	23,239	1,364	22,141	5.8	Finished
Wash walls.....cu. yds.	1,120	75	887	6.7	79.2
Stone filling.....cu. yds.	4,710	1,170	4,115	24.8	87.4
12-in. vitrified pipe.....lin. ft.	88	80	80	91	Finished
Iron castings.....lbs.	22,730	5,550	18,128	24.4	80
Structural steel.....lbs.	29,675	370	21,937	1.2	74
White oak in miter-sills.....ft. B. M.	3,490	0	2,740	0	78.5
Cobblestone gutters.....sq. yds.	235	128	233	54.5	Finished
Relaying old flagging.....sq. ft.	960	0	696	0	Finished
Fender fastenings.....No.	460	0	406	0	88.3
Brick sidewalks.....sq. yds.	62	0	62	0	Finished
Stone curbs.....lin. ft.	405	306	446	75.5	Finished
Stone curbs, reset.....lin. ft.	95	0	94	0	Finished
Cobblestone gutters, relaid.....sq. yds.	75	0	0	0	Finished
Crosswalks, relaid.....sq. yds.	75	0	74	0	Finished
Change in hydrant and connections.....lump sum	1	0	1	0	Finished
Change in steps and stoops.....lump sum	1	0	1	0	Finished
Removing concrete.....cu. ft.	419	76	289	18.1	Finished
Dressing concrete.....sq. ft.	130	0	113	0	Finished
Cast iron quoin-plates.....lbs.	9,470	0	9,673	0	Finished
24-in. vitrified pipe.....lin. ft.	260	0	230	0	Finished
Portland cement sidewalk.....sq. ft.	1,930	1,496	1,936.3	77.5	Finished
Crosswalks.....sq. ft.	250	0	228.9	0	Finished
Wooden fence.....lin. ft.	200	0	0	0	Finished
Iron fence.....lin. ft.	235	0	231	0	Finished
Treating fenders.....lin. ft.	4,610	0	3,240	0	70.5
Gravel concrete.....cu. yds.	56	0	54	0	Finished
Gravel concrete No. 2.....cu. yds.	560	41	553	7.3	Finished
Concrete wall.....lump sum	1	99.4%	99.4%	99.4	99.4
Foundation piles.....lin. ft.	7,660	6,052	6,052	79	Finished
Reinforced concrete.....cu. yds.	450	284	284	63.2	63.2
Metal reinforcement.....lbs.	81,300	53,406	53,406	65.5	65.5
Pumping, bailing and draining.....lump sum	1	100%	100%	100	Finished

Contract No. 11.

For excavating the canal and protecting its sides from Sta. 220 (0.4 mile northwest of the D. & H. R. R. crossing at Waterford) to Sta. 305 on the Mohawk river (about 1.6 miles below Crescent), including the construction of locks Nos. 4, 5 and 6 and appertaining structures, a highway, masonry for a guard-gate, bridge abutments and other incidental details.

Operations on this contract were suspended for the winter on December 5, 1911, and work was resumed on April 1, 1912.

The conditions of the work on other sections of the Erie canal rendered it imperative that navigation be turned through the Waterford flight of locks in the spring of 1913. The work on this contract has, therefore, been directed and prosecuted with a view to completing, at all events, the construction necessary to accomplish that end.

During the year about 23,000 cu. yds. have been excavated, of which 14,000 cu. yds. were in the rock cut above lock No. 6, 2,400 cu. yds. in the prism between locks Nos. 5 and 6 and the balance in by-passes and various other places over the whole contract. The material from this excavation has been placed in second-class embankments at the south core wall of lock No. 4, the north core wall of lock No. 6 and in spoil at the Mohawk river.

About 3,400 sq. ft. of rock channeling have been done, completing the same.

About 16,500 cu. yds. of first-class and 26,000 cu. yds. of second-class embankments have been placed, mostly at the various locks and core walls.

About 8,080 cu. yds. of concrete have been placed, completing the following structures: South core wall of lock No. 4; docking south side between locks Nos. 4 and 5; north core wall of lock No. 5; docking and walls between locks Nos. 5 and 6; south wall above lock No. 6; north and south walls at the Mohawk river.

The principal items remaining to be done are as follows:

Excavation	14,000 cu. yds.
First-class embankment	7,000 " "
Second-class embankment	30,000 " "

BARGE CANAL, CONTRACT NO. 11.

Completed prism in rock cut near the head of the land line between the Mohawk and Hudson rivers.

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Lining	4,040 cu. yds.
Yellow pine in fenders	124,500 ft. B. M.
Concrete	430 cu. yds.
Wash wall	2,100 “ “
Iron castings, plain	23,500 lbs.
Structural steel	29,300 “
5/8-in. log chains in fenders	20,000 “

There is little doubt that the work on this contract will be in such shape as to permit navigation next spring and will probably be completed before summer at about 91 per cent of the cost as computed from the preliminary estimate. On the same basis it is now about 89.4 per cent completed.

E. J. Becker, Assistant Engineer, had charge of this work up to April 1, and since that time it has been under the direction of H. C. Kline, Assistant Engineer.

The following is a detailed statement of the totals and percentages of work done to date and during the fiscal year, on each of the several items of this contract:

ITEMS OF WORK.	Preliminary estimate, as modified by alterations Nos. 1, 2, 4, 5, 6, 7 and 8.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Clearing lump sum	1	0	90%	0	90
Grubbing cu. yds.	15,000	0	8,094	0	Finished
All excavation cu. yds.	801,670	23,180	682,012	2.9	85.1
Sheeting and bracing ft. B. M.	270,000	4,096	252,062	1.5	Finished
Rock channeling sq. ft.	96,000	3,432	68,799	3.6	Finished
Embankment, first-class cu. yds.	116,300	16,432	97,119	14.1	83.5
Embankment, second-class cu. yds.	275,100	25,902	236,066	9.4	85.8
Lining cu. yds.	6,290	0	2,245	0	35.7
Spruce lumber ft. B. M.	5,000	0	0	0	0
White oak lumber ft. B. M.	9,600	0	9,600	0	Finished
Foundation piles, 15 ft. long No.	89	0	75	0	Finished
Foundation piles, 20 ft. long No.	261	0	258	0	Finished
Concrete cu. yds.	162,600	8,087	151,813	4.9	93.4
Wash wall cu. yds.	2,100	0	0	0	0
12-in. vitrified pipe lin. ft.	290	24	24	8.3	8.3
Back filling cu. yds.	290	17	17	5.9	5.9
Cobblestone paving sq. yds.	600	0	0	0	0
Steel castings lbs.	20,000	0	18,692	0	Finished
Iron castings, plain lbs.	370,330	18,853	325,365	5.1	87.8
Iron castings, machined lbs.	90,100	0	84,072	0	Finished
Structural steel lbs.	113,340	2,520	47,726	2.2	42.1
Metal reinforcement lbs.	431,740	117,891	417,237	27.4	96.6
Expansion bolts No.	614	0	0	0	0
4-in. log chains lbs.	20,000	0	0	0	0
Pipe railing ft.	500	0	0	0	0
Cast iron quoin-plates lbs.	46,000	0	46,508	0	Finished
Removing concrete cu. yds.	216	0	188	0	Finished
Dressing concrete sq. ft.	100	0	91	0	Finished
Yellow pine, short leaf ft. B. M.	124,500	0	0	0	0

Contract No. 91.

For building and equipping hydro-electric power plant on the Erie canal near the east end of the Crescent dam.

The excavation on this contract has been practically finished. About 830 cu. yds. of concrete have been placed, completing the masonry work in both the substructure and the superstructure, with the exception of the roof. The penstock and turbines have been placed in position. All the electrical equipment has been delivered, but its installation has not yet been started.

On account of the delay in ordering materials, etc., the work has progressed very slowly, but the quality of the completed work is very creditable.

The work on this contract shows only 44.6 per cent completed, as the electrical and governor equipments are not yet installed, and, judging from the present conditions, it is doubtful if the job will be finished before January, 1913.

This work has been under the direction of Assistant Engineers Becker and Kline, the same as contract No. 11.

The following is a detailed statement of the totals and percentages of work done during the year and to date, on the several items of this contract.

ITEMS OF WORK.	Preliminary estimate, as modified by alteration No. 1.	Work done during year	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Excavation.....cu. yds.	1,800	288	1,497	16	Finished
Concrete, first-class.....cu. yds.	146	128	123	87.7	Finished
Concrete, second-class.....cu. yds.	572	537	537	93.9	Finished
Concrete, first-class, reinforced.....cu. yds.	218	169	169	77.5	77.5
Structural steel.....lbs	56,177	44,302	44,302	78.8	78.8
Metal reinforcement.....lbs	17,524 5	10,712	10,712	61.1	61.1
Iron castings, machined.....lbs	18,409	14,705	14,705	79.9	79.9
Turbines, machined, and valves.....lump sum	1	90	90	90	90
Pumping, bailing and draining.....lump sum	1	57	80	57	80
Embankment, first-class.....cu. yds.	33	27	27	81.8	81.8
Wrought iron pipe.....lin. ft	15	0	0	0	0
Roofing.....squares	17	0	0	0	0
Painting.....sq. yds.	410	0	0	0	0
Electrical equipment.....lump sum	1	0	0	0	0
Governors.....lump sum	1	0	0	0	0
Traveling crane.....lump sum	1	0	0	0	0
Doors, windows and wood work.....lump sum	1	0	0	0	0
Polished brass railing and bronze.....lump sum	1	0	0	0	0
Miscellaneous accessories.....lump sum	1	0	0	0	0
Lavatory equipment.....lump sum	1	0	0	0	0
Roof covering.....lump sum	1	0	0	0	0
Doors, windows and wood work.....lump sum	1	0	0	0	0

Guard-gate, Tumbor gate by-pass and bridge at head of land line between Hudson and Mohawk rivers.

BARRE CANAL, CONTRACT No. 11.

1888

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Contract No. 33.

This contract provided for constructing lock-gates, needle-beams, guard and sluice-gates, lock-valves, etc., on several sections of the Erie and Champlain canals.

The only work of importance on this residency remaining to be done at the beginning of the fiscal year was the riveting of the gates of lock No. 6 and the placing and adjusting of lock-valves. This was completed and the plant removed before November 1, 1911.

The work was under the direction of E. J. Becker, Assistant Engineer.

Contract No. 16.

This contract provides for furnishing and erecting in place, steel highway bridge superstructures on several sections of the Erie and Champlain canals. The work on this residency consisted simply of a small bridge at Sta. 293 + 90, just west of the guard-gate on contract No. 11. Work was begun August 15, 1912, and finished September 20, 1912.

Quantities: Structural steel, 72,600 lbs.; sawed lumber (yellow pine or Douglas fir) 7,700 ft. B. M.

Contract No. 92.

For constructing power plants, electrical equipment and machinery for operating and lighting locks and guard-gate as follows: Erie canal locks Nos. 2, 3, 4, 5, 6 and 7, and guard-gate at Sta. 293 + 70; Champlain canal locks Nos. 6 and 8.

Plans have been completed and placed before the Canal Board.

ERIE CANAL, RESIDENCY NO. 2.

Resident Engineer S. W. Belding reports:

This residency extends from the west end of the aqueduct over the Mohawk river at Crescent to old lock No. 27, about 1.2 miles west of Cranesville, a distance of 32.8 miles.

The following contracts are located within the limits of this residency: Nos. 14-R, 8, 8-A, and portions of Nos. 14, 92 and 36.

The monumenting of the State's right-of-way line on both sides of the Mohawk river has been completed from the Crescent dam to Rexford Flats.

An estimate for the removal of timber, brush and buildings from the flooded area of contract No. 14 has been completed. Reports, accompanied by sketches and other data have been made for a large number of cases to come before the Board of Claims.

Contract No. 14.

This contract is for dredging a channel in the Mohawk river from Crescent to Rexford Flats; constructing dam No. 2 at Crescent; dam No. 3 and lock No. 7 at Vischer's Ferry; dam No. 9 and lock No. 13 at Yosts; dam No. 10 and lock No. 14 at Canajoharie; dam No. 11 and lock No. 15 at Fort Plain; retaining dam at Mindenville; highway changes and other incidental work.

Contractor, Acme Engineering & Contracting Company.

Assistant Engineer, in charge, J. C. Bell.

Dam No. 2, Crescent. Previous to September 30, 1911, the Crescent dam had been completed except for the final closure of six 33 $\frac{1}{3}$ -ft. sections, left open to pass the flow of the river. No work was done at this point until about August 15, 1912. On this date the contractor began assembling and erecting plant and machinery, and storing materials for the final closure of this dam.

Dam No. 3, Lock No. 7, Vischer's Ferry. Excavation has been continued in the canal prism and at both upper and lower approaches to the lock, the work in the upper approach being completed and that in the lower approach nearly so, while the excavation in the prism to the east of the lock has been only partially finished, a considerable amount of rock remaining to be drilled and removed.

The old masonry dam of the Watervliet Hydraulic Company near Dunsbach Ferry has been blasted and removed to the required grade. All embankment has been practically completed, most of the material for this work being obtained from the prism excavation. The small dam across the island, including its inter-

sections with the north and south channel dams, has been completed. The snubbing posts to the east of lock No. 7 are all in place and so also is the wash wall protection in this vicinity. In fact, the work at this point is practically finished with the exception of the final closure of nine 36-ft. openings left in the south channel dam to pass the flow of the river. Part of the necessary material to make this closure is already stored at the site of the work and the balance is about to be delivered.

Temporary Docking at Rexford Flats. Some plant and materials have been delivered for this work, but not much can be done before the closing of the old canal.

The following table shows the amount of work done during the year and the total to date:

ITEMS OF WORK.	Preliminary estimate, as affected by alterations.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Clearing.....lump sum	\$50	0	\$30	0	60
Grubbing.....cu. yds.	2,975	319	537	11	Finished
All excavation.....cu. yds.	390,807	31,656	341,290	8	88
Sheeting and bracing.....ft. B. M.	30,300	0	10,620	0	Finished
Embankment, first-class.....cu. yds.	108,013	10,018	94,700	9	87
Embankment, second-class.....cu. yds.	30,940	5,998	27,331	19	89
Lining.....cu. yds.	1,300	250	1,382	18	Finished
Sawed lumber, yellow pine or Douglas fir, ft. B. M.	73,960	3,550	4,930	5	7
Sawed lumber, hemlock.....ft. B. M.	319,100	57,160	277,770	18	87
Sawed lumber, white oak (in miter-sills and gates).....ft. B. M.	4,740	0	9,520	100	Finished
Sawed lumber, white oak.....ft. B. M.	68,000	6,850	58,170	10	86
Sawed lumber, creosoted yellow pine, ft. B. M.	14,900	7,730	14,360	52	97
Stone filling in cribs.....cu. yds.	9,085	1,965	5,691	22	63
Foundation piles, 16 ft. long.....No.	839	0	787	0	Finished
Foundation piles, 20 ft. long.....No.	84	0	34	0	Finished
Mooring piles, 20 ft. long.....No.	40	3	17	42	35
First-class concrete.....cu. yds.	21,000	184	18,870	9	90
Second-class concrete.....cu. yds.	137,870	4,031	119,299	3	87
Reinforced concrete.....cu. yds.	55	0	50	0	Finished
Wash wall.....cu. yds.	3,250	1,603	2,986	49	Finished
Second-class stone paving.....sq. yds.	110	76	93	69	Finished
Cobblestone paving.....sq. yds.	200	0	227	0	Finished
Ballast.....cu. yds.	15	13	13	87	Finished
Second-class riprap.....cu. yds.	8,140	0	7,417	0	Finished
24-inch vitrified pipe.....lin. ft.	200	0	181	0	Finished
Structural steel.....lbs.	61,300	6,756	46,907	11	77
Metal in lock-gates.....lbs.	332,000	56,222	327,044	17	Finished
Metal in needle-dams.....lbs.	84,000	5,486	62,799	7	75
Metal in lock-valves.....lbs.	58,400	0	56,852	0	Finished
Metal in head-gates.....lbs.	280,000	63,556	219,218	23	Finished
Metal reinforcement.....lbs.	9,955	107	10,842	1	Finished
Steel castings.....lbs.	7,000	0	5,765	0	Finished
Iron castings, plain.....lbs.	128,135	9,094	111,233	7	88
Iron castings, machined.....lbs.	32,800	0	28,798	0	Finished
Wooden fencing.....lin. ft.	1,210	288	1,208	23	Finished
Fender fastenings.....lbs.	1,170	116	1,162	10	Finished
24 in. x 36 in. sluice-valve.....No.	2	0	1	0	Finished
Machinery.....lbs.	8,000	9,046	9,046	100	Finished

Contract No. 14-R.

This contract is for the removal of bodies from cemeteries located within the limits of contract No. 14, flooded area, to new burial plots located outside the flow line.

Contractor, Thomas F. Riley.

Assistant Engineer, in charge, J. C. Cell.

This contract, which was for the removal of about 30 bodies from old cemeteries located near Crescent and Vischer's Ferry to new plots acquired by the State, has been completed and the final estimate rendered.

Miscellaneous Work.

Contractor, Acme Engineering & Contracting Company.

Assistant Engineer, in charge, F. W. Harris.

Under an agreement with the Superintendent of Public Works the Acme Engineering & Contracting Company has begun work on a new highway about 1½ miles long on the north side of the Mohawk river between Dunsbach Ferry and Forts Ferry. The land appropriations have been made and some grading and a little concrete work has been done.

On the south side of the Mohawk river a portion of the Rosendale road lying between Niskayuna and Vischer's Ferry is also to be improved under a similar agreement between the Superintendent of Public Works and the Acme Engineering & Contracting Company. Appropriation surveys and maps have been completed, but no work has yet been done.

Contract No. 8.

(This contract was suspended by order of the Canal Board, November 28, 1911, and cancelled March 11, 1912.)

This contract is for the construction of the following structures on the Mohawk river: Dam No. 4, lock No. 8, at Scotia, Sta. 1408 + 86; dam No. 5, lock No. 9, at Rotterdam, Sta. 1662 + 45; dam No. 6, lock No. 10, at Cranesville, Sta. 1987 + 79; and incidental work appertaining thereto. Length of canal included within the limits of these locks and their approaches, 0.7 mile.

Contractor, Pittsburg Eastern Company.

Assistant Engineer, in charge, W. J. Weigmann.

BAROE CANAL, CONTRACT NO. 8.
Movable dam at Cranesville in operation, maintaining pool above.



2000

Dam No. 4, Lock No. 8, Scotia. No work at this point, under the above contract, was done during the year. Wash drill borings ordered by the Board of Consulting Engineers were made for the purpose of determining the elevation of rock on the center line of dam, and were completed late in December, 1911. The result of these borings was shown on a new map and the samples labeled and filed.

Dam No. 5, Lock No. 9, Rotterdam. The contractor continued the work of removing coffer-dams and placing paving. The grading of spoil banks, clearing up site of work and some paving still remain to be done. After the suspension of the contract, the Whitehead-Kales Iron Company (subcontractors for erecting bridges, dam-gates, etc.) continued their work under an agreement with the Superintendent of Public Works, and practically completed the steel work, with the exception of a small amount of painting.

Dam No. 6, Lock No. 10, Cranesville. The work of repairing defective concrete in lock walls and abutments was continued until the suspension of the contract, but a large amount of this work is still to be done.

The following table shows the amount of work done during the year and the total to date:

ITEMS OF WORK.	Preliminary estimate as affected by all alterations.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Clearing.....lump sum	1	0	1	0	100
All excavation.....cu. yds.	368,261	0	243,303	0	66
Sheeting and bracing.....ft. B. M.	100,000	0	58,300	0	58
Forming embankment.....cu. yds.	69,040	0	38,458	0	56
Sawed lumber, yellow pine or Douglas fir ft. B. M.	107,000	35,960	64,460	37	60
Sawed lumber, white oak.....ft. B. M.	4,000	0	2,360	0	59
Foundation piles, 16 ft. long.....No.	3,258	0	849	0	26
Foundation piles, 18 ft. long.....No.	4,105	0	3,679	0	90
Foundation piles, 20 ft. long.....No.	1,100	0	135	0	12
Foundation piles, 25 ft. long.....No.	10,852	0	8,955	0	83
Foundation piles, 30 ft. long.....No.	350	0	262	0	75
Wooden sheet-piling.....ft. B. M.	446,560	0	350,500	0	78
Steel sheet-piling.....sq. ft.	21,000	0	0	0	0
Second-class concrete.....cu. yds.	73,061	0	7,900	0	11
Third-class concrete.....cu. yds.	1,610	0	1,284	0	80
Ballast.....cu. yds.	3,000	0	58	0	1.9
Second-class stone paving.....sq. yds.	13,950	793	6,977	5.7	50
First-class riprap.....cu. yds.	4,047	0	2,493	0	62
Second-class riprap.....cu. yds.	6,694	0	3,728	0	56
Third-class riprap.....cu. yds.	700	0	442	0	63
Fourth-class riprap.....cu. yds.	9,899	0	4,995	0	51
Iron castings.....lbs.	33,000	0	21,358	0	65
Cast iron idlers "A" and pins.....No.	100	34	66	34	66

ITEMS OF WORK.	Preliminary estimate, as affected by all alterations.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Cast iron idlers "B" and pins.....No.	12	4	8	33	67
Structural steel.....lbs.	3,743,629	605,745	2,486,203	16	66
Metal reinforcement.....lbs.	496,623	0	307,818	0	62
Uprights for dams Nos. 5 and 6... per pair	33	17	33	51.5	100
Gates "A".....No.	33	17	33	51.5	100
Gates "B".....No.	44	15	29	34	65
Gates "C".....No.	6	2	4	33	67
Gates "D".....No.	6	2	4	33	67
Shoes and anchorages.....No.	100	0	66	0	66
Upper lock-gates.....No.	.034	0	.034	0	100
Swing beams for needle-dams.....No.	6	0	4	0	67
Needles.....No.	186	0	186	0	100
Supports for valve-seats.....No.	12	0	8	0	67
Lock-valves.....No.	12	0	8	0	67
Wrought iron pipe railing.....lin. ft.	4,900	1,607	2,968	33	61
Wrought iron chain.....lbs.	220,000	67,788	146,969	31	67
Second-class gravel concrete.....cu. yds.	19,000	0	53,270	0	28
Second-class concrete, grout filling.....cu. yds.	4,200	0	2,774	0	66
Gravel ballast.....cu. yds.	1,000	0	1,984	0	198
Removing concrete.....cu. yds.	360	0	403	0	112
Upper lock-gates.....No.	6	0	4	0	67
Lower lock-gates.....No.	6	0	4	0	67
Emergency piling.....lin. ft.	88,650	0	53,240	0	60

Contract No. 8-A.

This contract is for the construction of lock No. 8 and sub-structure of dam No. 4, Scotia; for the completing of paving and riprap at lock No. 9 and dam No. 5 at Rotterdam, and lock No. 10 and dam No. 6 at Cranesville, together with other incidental work.

Contractor, The Foundation Company.

Assistant Engineer, in charge, W. J. Weigmann.

Dam No. 4, Lock No. 8, Scotia. The contractor began assembling and erecting plant, July 22, 1912. The construction of caissons and other work has progressed rapidly, the first concrete being placed about September 20, 1912.

No work has been done at other points.

Contract No. 36.

This contract is for providing operating winches for movable dams in the Mohawk river at Scotia, Rotterdam, Cranesville, Amsterdam, Tribes Hill, Yosts, Canajoharie and Fort Plain.

Contractor, J. D. Miller.

Assistant Engineer, in charge, W. J. Weigmann.

The winches for dams Nos. 5 and 6 have been delivered and erected, and those for dam No. 4 have been delivered and stored in a building provided by the State near the site of the dam. Final estimate for this work has been submitted.

ERIE CANAL, MOHAWK RIVER RESIDENCY, DREDGING CONTRACTS
Nos. 20-B, 20-C, 20-D AND CONTRACT NO. 86.

Resident Engineer E. A. Lamb reports:

The so-called Mohawk River Residency includes contract No. 20-B, extending from Sta. 3872 + 35, the upper miter-sill of lock No. 16 at Mindenville, to Sta. 3361 + 85, the upper miter-sill of lock No. 14 at Canajoharie; contract No. 20-C, extending from the upper miter-sill of lock No. 14 at Canajoharie to Sta. 2948 + 75, the upper miter-sill of lock No. 13 at Yosts; contract No. 20-D, extending from the upper miter-sill of lock No. 13 at Yosts to deep water below the aqueduct at Rexford Flats; also contract No. 86, for the reconstruction of a portion of the bridge between the villages of Canajoharie and Palatine Bridge. The total length of this residency, or the length of contracts Nos. 20-B, 20-C and 20-D, combined, is 54.2 miles.

Contract No. 20-B.

Working drawings traced from the mounted maps for this contract have been finished in the residency office. During the year surveys of the following parcels have been made, mapped and checked, and sent to the Division Engineer: Omega Commercial Co., 2 parcels; N. Y. C. & H. R. R. R. Co.; Irvin Miller; Charles D. Smith; reconveyance maps for Maria E. Failing Estate, and four reconveyance maps for reconveying portions of parcels Nos. 1679 and 3198 to Irvin Miller. Also reports on claims for appropriations, with small location map attached, have been sent to Albany for the following claimants: Hix Furniture Co., William H. Allen, H. P. Allen, N. Y. C. & H. R. R. R. Co. (2 parcels) and Irvin Miller. With the possible exception of one or two parcels, all these appropriations have been monumented.

Range stakes and gages have been set and maintained for the contractor in carrying on the prism excavation. Original cross-

sections ahead of the dredge have been taken, also cross-sections at the end of each month, and end of season cross-sections, where it was considered necessary.

During the year, no work has been done east of the Otsquaga creek at Fort Plain.

The two dipper dredges, the hydraulic disposal boat, with the pontoon line, and the orange-peel dredge, and for a portion of the time, the 10-ton crane, together with the tug boat, one large and four small rock scows, a coal scow and one small dump scow, have worked together at the prism excavation. During the year, the prism has been completed between Stas. 3856 and 3757 + 50, except about 1,000 cu. yds. of excavation near the St. Johnsville highway bridge and about 3,000 cu. yds. of ledge rock a few hundred feet below this bridge.

The excavated material from the prism has been placed in spoil along the north and south sides of the river, usually levees being built and the finer material pumped into this area by the hydraulic disposal boat and the pipe line. The coarse material, larger than six inches was placed along the face of the river bank where the original bank has been disturbed by the excavation. Usually, this facing began at the prism grade.

The stream entrance work at Otsquaga creek was nearly finished, October 1, 1912. Concrete was used in place of nearly all the fourth-class riprap and also the first and second-class riprap and all the first-class stone paving.

The new plant, put in commission on this contract during the year, consisted of a Lobnitz rock breaker. The hull of this rock breaker is 100 ft. long, 28 ft. wide and 6 ft. deep. The machinery consists of one boiler of the locomotive type, 8 ft. 6 in. in diameter and 8 ft. 6 in. long, operating one main hoist engine of about 50 horse-power. This engine operates the 10-ton ram, which is 19 ft. long and has an average diameter of 22 inches with an average fall of 9 ft. A small feed pump is connected to the main engine, which in turn is connected to the feed water heater which heats the water before it goes to the boiler. The boiler is in the stern of the boat and the main engine near the forward end and midway between is located a maneuvering engine, operating six winches, which control cables holding the boat in position. The ram is held in position for work by an "A" frame, consisting of

two box girders 37 ft. 10 in. long by 1 ft. 2 in. by 1 ft. 1 in., made of two 12 in. channels and two ½ in. cover plates, also a tie girder 34 ft. 8 in. by 18 ft. 2 in. by 1 ft. 1 in. The crew necessary to operate this breaker consists of four men, captain, engineer, deckhand and fireman. This rock breaker began work July 19, and to October 1, 1912, about 100 shifts of eight hours each have been spent in breaking about 2,500 cu. yds. of *very* hard rock.

The total work done to October 1, 1910, on this contract was \$9,260. At that time, approximately 1 per cent of the contract was completed. On October 1, 1911, \$33,480 worth of work had been completed, or 17 per cent, and on October 1, 1912, \$459,710, or 49 per cent, of the contract finished. In other words, practically 32 per cent of the contract in money value has been done during the year September 30, 1911, to September 30, 1912.

L. H. M. Whitney, with office at St. Johnsville, has been Engineer in charge of this contract during the year.

The following table shows the amount of work done during the year and the total to date:

ITEMS OF WORK.	Preliminary estimate, as affected by alterations.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Clearing.....lump sum		0	45 ⁰⁰ / ₁₀₀	0	45
Excavation.....cu. yds.	1,462,900	416,887	660,743	28	45
Lining.....cu. yds.	360	0	32	0	9
Wash wall.....cu. yds.	1,308	1,308	1,308	100	100
First-class paving.....sq. yds.	1,600	396	1,134	25	71
First-class riprap.....cu. yds.	550	142	348	26	63
Second-class riprap.....cu. yds.	600	134	293	22	47
Third-class riprap.....cu. yds.	600	0	124	0	20
Fourth-class riprap.....cu. yds.	15,600	154	724	1	5
Cobblestone protection.....cu. yds.	20,000	13,512	13,512	67	67

Contract No. 20-C.

Surveys of the following parcels have been made, mapped and checked, and forwarded to the Division Engineer: Simeon Sponenburg (2 parcels), Florence M. Keck (2 parcels), Jane Elizabeth Spraker, William Diefendorf and Jay Van Evra, Sylvanus Nellis (2 parcels), N. Y. C. & H. R. R. R. Co. (2 parcels), Lydia and Emma Van Evra Coddington, Montgomery Co.;

and the following release maps: Town of Canajoharie and four release maps for N. Y. C. & H. R. R. Co. parcels.

Original cross-sections have been taken ahead of the dredge and the necessary range stakes, etc., for the entire contract have been set and maintained.

The prism excavation during the year has progressed so that nearly all the excavation suitable for the hydraulic dredge to handle was done by August 8, at which time the hydraulic dredge *Mohawk* moved through lock No. 13 on to contract No. 20-D.

On October 1, 1912, the prism was finished between the following stations:

Dam No. 10, lock No. 14 and Sta. 3343.

Station 3341 and Station 3334.

Station 3306 and Station 3248.

Station 3216 and Station 3180.

Station 2994 and dam No. 9, lock No. 13.

Between the following stations there is yet to be excavated of the original material a total of about 50,000 cu. yds. and about 18,000 cu. yds. of material which has washed in since work began:

Between Stations 3341 and 3343, some material left in.

Between Stations 3334 and 3306, some material left in.

Between Stations 3216 and 3248, some material left in.

Between Stations 3180 and 3143, prism partly complete; material left on one side.

Between 3143 and 2994, deep water, nearly complete; little excavation at the sides.

The spoil areas on this contract made during the year include the one east of Flat creek, one opposite Yatesville creek between the river and the N. Y. C. R. R., one east of Yatesville creek extending along the north side of the tow-path and one between the Erie canal and the upper guide wall of Barge canal lock No. 13.

The stream entrance work at Canajoharie creek, at the creeks at Stas. 3269 and 3309 and at Bread creek have been completed, also about two-thirds of the work at Flat creek. Stone has been quarried and hauled for the work at Iashers and Yatesville creeks.

The total excavation for the year on this contract has been 515,162 cu. yds.

The total work done to October 1, 1910, was \$7,640, or approximately 1.3 per cent of the contract. On October 1, 1911, \$324,260 worth of work had been completed, or 55 per cent of the contract. And on October 1, 1912, there was \$512,385 worth of the original contract work done, or 87.4 per cent of the original contract completed. Extra work to the amount of \$81,805 has also been done outside the original contract and included in the estimate in accordance with directions from the Division Engineer and Special Deputy State Engineer. This extra work of \$81,805 is made up of the following quantities:

11,692 cu. yds. of material washed in the completed prism from above contract No. 20-C.

34,025 cu. yds. was a mistake in the preliminary estimate between Sta. 2994 and 3014.

The 114,685 cu. yds. over-depth excavated between elevation 270 and 274 between Stas. 3287 and 3248 was very soft material and was done in order that coarse material (gravel and cobbles) might be placed in the prism as lining to protect the prism from scour. This work was done in 1911.

During the year ending September 30, 1912, there has been 32.4 per cent of money value of the original contract completed, plus the extra work noted above.

A. G. Austin, Assistant Engineer, with office at Canajoharie, has been in charge of this contract during the year.

The following table shows the amount of work done during the year and the total to date:

ITEMS OF WORK.	Preliminary estimate, as affected by alterations.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Clearing..... lump sum		10%	90%	10	90
Excavation..... cu. yds.	1,260,402	515,162	1,144,448	41	91
Lining..... cu. yds.	480	122	122	25	25
First-class paving..... sq. yds.	2,500	723	1,072	29	43
First-class riprap..... cu. yds.	700	223	337	33	48
Second-class riprap..... cu. yds.	700	179	329	25	47
Third-class riprap..... cu. yds.	400	11	85	3	21
Fourth-class riprap..... cu. yds.	2,600	939	1,194	36	46
Extra Work Order dated January 24, 1912.					
Fourth-class riprap..... cu. yds.	1,276.24	1,276.24	1,276.24	100	100

Contract No. 20-D.

The appropriation surveys for the following parcels have been made, computed, mapped and sent to the Division Engineer: Alfred DeGraff, N. Y. C. & H. R. R. R. Co. (4 parcels), N. Y. State Realty & Terminal Co. (2 parcels), Alfred DeGraff, Frederick Davey, Isaac Conover, Fletcher Van Wie, Jacob Larrahee, E. T. Leavenworth Estate, Mrs. Isaac Swart, Frank Starin, Henry Johnson, Francis Van Epps, Evert Van Epps, Elizabeth Starin, Joseph Moore, Frank Starin, Chas. Christman and Victor Snyder. All of the above parcels have been monumented, except the islands.

Original cross-sections of the river for prism excavation have been taken between Sta. 2147 and 2064, 2000 and 1957 and between Sta. 2840 and 2942.

At the aqueduct, Sta. 1051, the contractor resumed operations late this summer. They repaired the coffer-dam and began where they left the work the season before, to strip the ledge rock and drilling same. On October 1, 1912, there was left to be drilled and blown below the dam something like 500 cu. yds., so that there remains to be taken out below the dam between Sta. 1053 + 50 and 1,060 over 3,000 cu. yds., about 1,354 cu. yds. having been placed in spoil during the year.

Sometime in December, the Mohawk Valley Boat and Machine Co. began the construction of the hull for a hydraulic dredge. This hull was launched April 6, 1912, and completed July 20, beginning the prism excavation at Sta. 2128. This dredge was named *Amsterdam*. It is a 20-inch hydraulic dredge. The Morris Machine Co. furnished and equipped the dredge with the machinery. The dredge hull is wood,—137 ft. 8 in. long, 40 ft. wide and 10 ft. 2 in. deep. The main dredging pump is made of Manganese steel, 20-in. suction and 20-in. discharge, with Manganese steel running, suction and discharge piping also of Manganese steel. The main engine is directly connected to the pump, which engine is 1,000-hp. and has cylinders 17 in., 27½, and 42 in. in diameter with a common stroke of 20 inches. The steam pressure is 200 pounds. The boiler equipment consists of four water tube boilers, built by the Heine Safety Boiler Co., each boiler being 225-hp. The boilers are arranged in two bat-

teries facing together, forced draft being used. Two 10-in. discharge, centrifugal, circulating pumps are arranged so that they can deliver through the condenser in opposite direction, only one circulating pump being in service at a time. The air pump is of the vertical twin beam type, $7\frac{1}{2}$ x $16\frac{1}{2}$ x 10 in. The cutter ladder is 50 ft. long, made throughout of steel, with a depth of ladder girder at upper end of 42 in. The cutter shaft is $8\frac{1}{2}$ in. in diameter. The cutter engine is a 12 x 12 in. double cylinder, driving the cutter shaft through cast steel gears. The winding or swinging engine is $8\frac{1}{4}$ x 12 in., double cylinder, five drum, compound geared. The ladder drum is 24 in. in diameter, the spud drums, 24 in. in diameter and the swinging drums, 20 in. in diameter. The auxiliary machinery equipment includes a 15-kw., directly connected, generator set. Two large dump scows have also been built during the year. These scows are 105 ft. long, 26 ft. beam and 7 ft. 6 in. deep, with a capacity of from 200 to 250 cu. yds. A tugboat has also been built during the year. It was named *Dorothy*,—length 60 ft., beam 16 ft. and draft 5 ft. 6 inches. The engine is 13 x 14 in. boiler return tubular for 150 pounds pressure. A gasoline motor boat has been put in commission,—31 ft. long and 6 ft. beam, with a 30-hp. 3-cylinder Barlow engine.

The dipper dredge and the hydraulic dredge *Amsterdam* on this contract did the prism excavation between lock No. 11 and the highway bridge, spoiling the material along the north side of the river on the Gardinier islands, and on the south side of the river west of South Chuctannunda creek. The work between these places is completed, except a small amount of material left in the prism, the Chuctannunda creek excavation and the excavation in the back channel below dam No. 7. No work of any nature has been done between lock No. 11 and lock No. 12.

The rock excavation in the prism above lock No. 12 at Tribes Hill, Sta. 2440 + 44 to Sta. 2450, was resumed early in the summer. This work, together with the stream entrance work on contracts Nos. 20-C and 20-D, has been done by representatives of the Banker's Surety Company, Maryland, who were bondsmen for a company, which it is said, sublet this work from the American Pipe and Construction Co.

But very little progress has been made — partly on account of high water, which seemed to catch them just as they were beginning to make some progress.

The rock was removed to spoil with cars drawn by small locomotives and with wheelbarrows, about 3,823 cu. yds. of prism excavation being done between Stas. 2440 + 44 and 2450. Also about 27 cu. yds. of second-class concrete were placed in the concrete dike.

About three-quarters of the stone work at Danoscara creek was done, also about 1,100 cu. yds. of excavation. About 177 cu. yds. of excavation was done at Auriesville creek.

On August 8 the hydraulic dredge *Mohawk* moved through lock No. 13 at Yosts and began the prism excavation on contract No. 20-D, so that on October 1 of the prism excavation from Sta. 2948 to 2937 + 60 and from Sta. 2916 to 2910, only the softer or hydraulic dredge material has been excavated. From Sta. 2910 to 2846 + 05, the prism excavation has been completed. The total excavation done from lock No. 13 to Sta. 2846 + 05 amounted to 154,673 cu. yds. This material was all spoiled between the south bank of the river and the present Erie canal tow-path.

The first estimate, contract No. 20-D, was given May, 1911. On October 1, 1911, \$62,740 worth of work in money value was completed on this contract. On October 1, 1912, in money value, there was \$276,880 worth of work done, or about 10 per cent of the contract was completed.

The engineering work on this contract has been in charge of M. E. James, Assistant Engineer, with office in Amsterdam, and T. S. Bailey, Assistant Engineer, practically in charge of Section No. 2, with field office at Cranesville.

The following table shows the amount of work done during the year and the total to date:

ITEMS OF WORK.	Preliminary estimate, as affected by alterations.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Clearing.....lump sum	.....	0	8%	0	8
Excavation.....cu. yds.	5,152,700	416,496	538,868	8	10
Lining.....cu. yds.	650	18	18	3	3
Second-class concrete.....cu. yds.	400	38	61	9	15
First-class paving.....sq. yds.	3,600	114	114	3	3
First-class riprap.....cu. yds.	2,000	67	67	3	3
Second-class riprap.....cu. yds.	2,150	61	61	3	3
Fourth-class riprap.....cu. yds.	3,000	123	123	2	2

Contract No. 86.

On this contract, during the year, the north pier was built and the brick and concrete of the two old spans to be removed was taken out. A temporary bridge was completed, built on piles with timber bents, across the river from the south to the north approach and opened for traffic.

The ends of the two spans resting on the old pier to be rebuilt were raised and supported by timber bents and the excavation of the old pier was begun. About 11.3 per cent of this contract has been done to date.

C. R. DeGraff, Assistant Engineer, has been in charge of this contract during the year, with office in Canajoharie.

The following table shows the amount of work done during the year and the total to date:

ITEMS OF WORK.	Preliminary estimate, as affected by alterations.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Excavation..... cu. yds.	5,000	738	738	15	15
Sheeting and bracing..... ft. B. M.	12,039,000	12,039,000	12,039,000	100	100
Second-class concrete..... cu. yds.	1,150	455	455	40	40
Structural steel..... lbs.	414,000	27	27	0.06	0.06
Metal reinforcement..... lbs.	10,600	1,161	1,161	11	11
Iron castings..... lbs.	2,300	880	880	38	38
Test piles..... No.	4	2	2	50	50
Coffer-dam, pumping, bailing and draining					
lump sum.....		25	25	25	25

ERIE CANAL, RESIDENCY NO. 3.

Resident Engineer Ernest D. Hendricks reports:

The limits of this residency are the old lock No. 27, near Craneville, on the east, and the old lock No. 34, near Minden-ville, on the west. The work on this residency, however, consists of that connected with contract No. 17, the portions of contracts Nos. 14 and 36 that lie within the above limits, and the operation and care of movable dams Nos. 5, 6, 7, 8, 9, 10, and 11.

Surveys.

Sections have been taken and plotted below dams Nos. 5, 6, 9, and 10, to show the scour caused by the operation of the dams. The setting of concrete monuments on the boundaries of State lands has been continued.

Office Work.

The work on the final estimates has progressed as follows: The estimate for contract No. 17 has been completed and turned in. The final estimate for section 3, contract No. 14, is 75 per cent completed.

Contract No. 17.

The work on this contract includes the construction of dam No. 7, lock No. 11, at Amsterdam and dam No. 8, lock No. 12, at Tribes Hill. The contract work has been performed by Alexander Murdoch. The work on this contract has been completed and the final estimate turned in.

Dam No. 7, Lock No. 11. During the past year the wooden contact strips for the dam gates have been placed and the dam has been lowered and tested.

Dam No. 8, Lock No. 12. During the year the dam sill was cleaned of sand and gravel and the dam has been lowered and tested.

The engineering work on this contract has been in charge of M. E. James, Assistant Engineer.

The following table shows the amount of work done during the year and the total to date:

ITEMS OF WORK.	Preliminary estimate, as affected by alterations.	Work done during year by Alexander Murdoch.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Clearing lump sum	\$250	20%	100%	100	Finished
All excavation cu. yds.	185,336	8,052	153,958	4.3	Finished
Drilling bolt holes in rock lin. ft.	150	0	100	0	Finished
Sheeting and bracing ft. B. M.	100,000	4,117	98,152	4.1	Finished
Forming embankment cu. yds.	33,000	935	22,983	2.8	Finished
Puddle	225	3	159	1.3	Finished
Sawed lumber, yellow pine or Douglas fir ft. B. M.	72,000	25	69,079	0	Finished
Sawed lumber, white oak ft. B. M.	3,000	0	2,362	0	Finished
Foundation piles, 15 ft. long No.	547	0	495	0	Finished
Foundation piles, 16 ft. long No.	1,100	0	931	0	Finished
Foundation piles, 20 ft. long No.	500	0	342	0	Finished
Wooden sheet-piling ft. B. M.	75,000	7	58,425	0	Finished
Steel sheet-piling sq. ft.	700	0	573	0	Finished
Second-class concrete cu. yds.	49,977	113	47,395	0.2	Finished
Third-class concrete cu. yds.	1,794	14	1,325	0.7	Finished
Wash wall cu. yds.	7,000	62	5,423	0.8	Finished
Ballast cu. yds.	1,021	7	869	0.6	Finished
Second-class stone paving sq. yds.	400	0	346	0	Finished
Hand-laid riprap cu. yds.	4,200	*3	3,619	0	Finished
First-class riprap cu. yds.	4,300	1	3,969	0	Finished
Second-class riprap cu. yds.	5,300	0	5,002	*0	Finished
Fourth-class riprap cu. yds.	4,310	1	4,139	0	Finished
Iron castings lbs.	25,000	*660	20,983	*2.6	Finished

ITEMS OF WORK.	Preliminary estimate, as affected by alterations.	Work done during year by Alexander Murdoch.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Structural steel..... lbs.	2,617,000	34,133	2,582,810	1 3	Finished
Metal reinforcement..... lbs.	182,247	527	188,934	0 2	Finished
Cast iron idlers "A"..... No.	70	0	70	0	Finished
Cast iron idlers "B"..... No.	8	0	8	0	Finished
Uprights for dam No. 7..... pairs	19	0	19	0	Finished
Uprights for dam No. 8..... pairs	16	0	16	0	Finished
Gates "A," "Ax," "Ay" for dam No. 7..... No.	19	0	19	0	Finished
Gates "B" for dam No. 7..... No.	17	0	17	0	Finished
Gates "C" for dam No. 7..... No.	2	0	2	0	Finished
Gates "D" for dam No. 7..... No.	4	0	4	0	Finished
Gates "F," "Fx," "Fy" for dam No. 8..... No.	16	0	16	0	Finished
Gates "G" for dam No. 8..... No.	14	0	14	0	Finished
Gates "H" for dam No. 8..... No.	2	0	2	0	Finished
Shoes for uprights, dam No. 7..... No.	38	0	38	0	Finished
Shoes for uprights, dam No. 8..... No.	32	0	32	0	Finished
Wrought iron chains..... lbs.	141,000	*520	139,591	*0 3	Finished
Upper lock-gates, complete..... No.	4	0	4	0	Finished
Lower lock-gates, complete..... No.	4	0	4	0	Finished
Needle-dams, complete with anchorages..... No.	4	0	4	0	Finished
Supports for valve-seats..... No.	8	0	8	0	Finished
Lock-valves with seats, tracks and guides..... No.	8	0	8	0	Finished
Wrought iron pipe railing..... lin. ft	3,000	0	3,053	0	Finished

* A decrease, due to final estimate computations.

Contract No. 14, Section No. 3.

The work on this contract includes the construction of dam No. 9 and lock No. 13 at Yosts, dam No. 10 and lock No. 14 at Canajoharie, dam No. 11 and lock No. 15 at Fort Plain, and the retaining dam at Mindenville. The Acme Engineering and Contracting Company have advanced the work as follows during the year:

Dam No. 9 and Lock No. 13 at Yosts. The work connected with the lower guide wall of the lock has been completed, including the removal of coffer-dams. This completes the work connected with the lock, except some minor repairs and the removal of a small amount of coffer-dam. The bridge and dam have been erected, painted and tested. The coffer-dam below the north span of the dam has been removed.

There remains to be done, the removal of the coffer-dam above the north span of the dam.

The engineering work on this contract has been in charge of J. D. Williams.

Dam No. 10 and Lock No. 14 at Canajoharie. During the past year the following work has been done:

The embankment back of the river wall of the lock has been placed and the paving and riprap placed. The lock gates have been completed. The bridge and dam have been completed, painted and the flooring laid. The paving around the abutments of the bridge has been laid.

There remains to be done, the removal of coffer-dams and some minor repairs to the lock and the testing of the dam.

The engineering work has been in charge of Lewis Bartlett.

Dam No. 11 and Lock No. 15 at Fort Plain. During the year the following work has been completed: Embankment and grading behind the lower guide wall and lock; flooring on lock gates and needle-dams; setting lock valves; paving back of north abutment; riprap above and below the lock; the fitting and repair of lock gates.

There remains to be done, the removal of the coffer-dams.

The engineering work has been in charge of Lewis Bartlett.

Mindenville Retaining Dam. The work on this dam was completed in 1909 and the final estimate has been turned in.

The following table shows the amount of work done during the year and the total to date:

ITEMS OF WORK.	Preliminary estimate, as affected by alterations.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Clearing..... lump sum	\$50	0	\$40	0	80
All excavation..... cu. yds.	423,165	4,811	232,043	1	69
Sheeting and bracing..... ft. B. M.	83,412	0	82,241	0	98
Forming embankment..... cu. yds.	65,877	8,906	48,490	13	73
Sawed lumber, yellow pine..... ft. B. M.	115,890	46,859	101,233	40	87
Sawed lumber, hemlock..... ft. B. M.	64,962	0	49,094	0	76
White oak in miter-sills and gates..... ft. B. M.	35,100	9,042	25,693	26	73
Sawed lumber, white oak..... ft. B. M.	7,000	0	6,155	0	87
Crescoted yellow pine or Douglas fir..... ft. B. M.	15,701	7,544	15,006	48	95
Stone filling in cribs..... cu. yds.	1,400	0	1,181	0	84
Foundation piles, 10 ft. long..... No.	70	0	79	0	112
Foundation piles, 12 ft. long..... No.	118	0	85	0	72
Foundation piles, 14 ft. long..... No.	1,500	0	38	0	2
Foundation piles, 16 ft. long..... No.	2,562	0	1,665	0	64
Foundation piles, 20 ft. long*..... No.	.....	0	338	0	.....
Wooden sheet-piling..... ft. B. M.	115,270	0	85,824	0	74
Second-class concrete..... cu. yds.	75,199	2	64,732	0	86
Third-class concrete..... cu. yds.	1,280	0	793	0	61
Reinforced concrete..... cu. yds.	.....	0	1	0	.....
Second-class stone paving..... sq. yds.	3,577	950	3,371	26	94
Third-class stone paving..... sq. yds.	460	0	371	0	80
Ballast..... cu. yds.	2,263	296	1,695	13	74
First-class riprap..... cu. yds.	2,847	0	2,564	0	90
Second-class riprap..... cu. yds.	7,460	41	5,900	1	79
Third-class riprap..... cu. yds.	942	89	928	9	98
Fourth-class riprap..... cu. yds.	8,607	932	7,552	10	87
Structural steel..... lbs.	2,526,966	565,515	2,573,813	22	101

ITEMS OF WORK.	Preliminary estimate, as affected by alterations.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Metal in uprights for dams..... lbs.	580,000	258,156	537,515	43	92
Metal in gates for dams..... lbs.	830,000	420,842	777,741	51	93
Metal in lock-gates..... lbs.	566,400	27,735	496,868	4	87
Metal in needle-dams..... lbs.	246,000	27,041	167,336	10	68
Metal in lock-valves..... lbs.	60,600	22,277	66,847	32	96
Metal reinforcement..... lbs.	198,769	0	171,478	0	86
Iron castings, plain..... lbs.	34,900	386	31,421	1	90
Iron castings, machined..... lbs.	22,200	0	19,425	0	87
Cast iron shoes for uprights..... lbs.	86,000	0	82,006	0	95
Wrought iron chains..... lbs.	148,000	50,826	139,905	40	94
Wrought iron pipe railing..... lin. ft.	3,500	2,237	3,443	63	98

* Substituted for piles 16 ft. long.

Contract No. 36.

The contract consists of furnishing sixteen winches for the eight movable dams. The winches have all been placed on the dams, except dam No. 4, which is not yet completed. All these winches except the latter two have been used.

Operation of Movable Dams.

The specifications for the dredging contracts call for the lowering of the dams in the Mohawk river to facilitate dredging operations. Dams Nos. 5, 6, 9, and 11 have been operated during the year and dams Nos. 8 and 10 have been prepared for operation. A dam-tender with an assistant is employed during the day on each of the dams that has been lowered, while two watchmen are employed during the two remaining shifts, to maintain steam in at least one of the boilers of the winches and to protect the property of the State against theft or injury. Gage readings are taken at least twice a day above and below the dams, also after raising or lowering any gate of the dam, and at frequent intervals during high water. The object of this gage record is to protect the State in case of claims for damages due to the operation of the dams, to show the progress of floods down the river and to determine the leakage through the dams, the position of the gates of the dam being recorded at the time of the readings.

It is necessary to employ a larger force while raising or lowering the dams and after a period of high water, to remove debris and drift that is entangled in the chains of the gates and uprights.

In connection with the operation of the dams, lock No. 10 at Cranesville and lock No. 13 at Yosts have been utilized to lock through the dredges and other boats of the contractors.

A. O. Hollenbeck has superintended the operation of dams Nos. 5 and 6; J. D. Williams, the operation of dam No. 9 and Lewis Bartlett, that of dam No. 11.

ERIE CANAL, RESIDENCY No. 4.

Resident Engineer Philip H. Dater reports:

Residency No. 4 of the Erie canal extends from a point 2,400 feet east of lock No. 34 of the present canal at Mindenville, Montgomery county, to the division line between contracts Nos. 30 and 29, near Sterling creek, and four miles east of the easterly boundary line of the city of Utica. The length of the Barge canal within the limits of Residency No. 4 is 23.8 miles.

The construction work on this residency is divided into the following main contracts:

Contract No. 18. Land line from one-half mile east of Mindenville to Indian Castle. Length, 3.63 miles. Kelley Bros. Contracting Co., Syracuse, N. Y., contractors. Final estimate of contract as revised, \$476,978.85.

Contract No. 20-A. Land line and dredging from Indian Castle to Little Falls. Length, 4.5 miles. Houston Barnard, Rochester, N. Y., contractor. Contract price, \$490,592.50.

Contract No. 31. Land line through Little Falls. Length, 1.01 miles. Casey & Murray, Rochester, N. Y., contractors. Contract price, \$829,770.43.

Contract No. 30. Land line and dredging river from Little Falls to Sterling creek. Length, 14.62 miles. Acme Engineering and Contracting Company, Herkimer, N. Y., contractors. Contract price, \$2,591,666.50.

Contract No. 13. Superstructures for two bridges on contract No. 18 are included in this contract. Penn Bridge Co., Beaver Falls, Pa., contractors. Final estimate, Residency No. 4 portion, \$9,932.18.

The following contracts have not been awarded:

Contract No. 18-A. For the completion of the unfinished portion of contract No. 18. Plans nearly completed.

BARGE CANAL, CONTRACT NO. 31.

Site of Barge canal lock No. 17, at Little Falls, before beginning of construction.

1891.

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Contract No. 87. Bridge across the canal in the vicinity of Rocky Rift dam.

Contract No. 92. A part of this contract covers the construction of the hydro-electric power plants and equipment for operating and lighting locks Nos. 16, 17 and 18. Plans nearly completed.

Contract No. 107. For the construction of a lift bridge at German street, Little Falls, a fixed emergency bridge near by, and adjacent prism work. It is expected that this contract will be under construction during the coming winter.

In order to complete the Barge canal, the following additional work will be required:

On Contract No. 31. A cut-off dam at lock No. 17; puddling and protecting bottom and north bank of canal between Moss island and Seeley island; the removal of the old locks and some prism excavation, which at the present time can not be done on account of the old canal.

On Contract No. 30. Constructing necessary connections between the existing canal and the Barge canal at various points between Jacksonburg and Mohawk.

In order that there may be no delay in the completion of contracts already in force, I would recommend that work on this residency not now under contract be planned so that the new channel of the Barge canal between Mindenville and Little Falls, or Fort Herkimer, can be used for boats of the present Erie canal type at the opening of navigation in the spring of 1914. Otherwise the work to be done in changing from the present canal to the Barge canal will be greater than can be accomplished readily during one winter.

The following statements show the progress made on construction work during the past year for the contracts actively in force on the residency.

Contract No. 20-A.

This contract begins at the western end of contract No. 18, at Indian Castle, and extends to the eastern end of contract No. 31, at Little Falls. The work includes 0.7 mile of land line at the eastern end and 3.8 miles of dredging in the Mohawk river

between Rocky Rift dam and Little Falls. The contract was let on August 20, 1909, to Houston Barnard, of Rochester, N. Y. During the first year of this contract 8.5 per cent was done, during the second year 15.9 per cent and during the past year 36.6 per cent. During the present year rock excavation in the land line has been completed. There remains to be done on the land line a small amount of earth excavation near Castle creek and the cutting through of the ridge between the land line and the river. The north embankment across Castle creek has been placed and the stream now empties into the new canal. More than two-thirds of the wash wall has been completed. The 12-inch hydraulic dredge *Indian Castle* has nearly completed the earth excavation in the river. Work completed to September 30, 1912, is 61 per cent.

The engineering work on this contract is in charge of E. E. Kendall, Assistant Engineer.

The following summary shows the amount of work put under contract and the amount done to September 30, 1912, including alterations in force and extra work orders:

ITEMS OF WORK.	Preliminary estimate, as affected by alterations.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Clearing.....lump sum	\$120	0	0	0	0
Grubbing.....cu. yds.	500	46	305	9 2	61
Excavation.....cu. yds.	538,000	213,390	362,100	36 3	61.6
Sheeting and bracing.....ft. B. M.	4,000	0	0	0	0
Round timber bracing.....lin. ft.	250	0	0	0	0
Forming embankment.....cu. yds.	8,860	2,644	4,567	29 8	51.5
Lining.....cu. yds.	100	0	0	0	0
Wash wall.....cu. yds.	6,000	3,660	3,660	61	61
First-class riprap.....cu. yds.	100	0	0	0	0
Second-class riprap.....cu. yds.	200	0	0	0	0
Third-class riprap.....cu. yds.	300	0	0	0	0
Fourth-class riprap.....cu. yds.	500	0	0	0	0
<i>Extra Work Order.</i>					
Moving bridge over R. R. feeder, Sta. 4079 lump sum	.....	.....	\$200	.....	100

Contract No. 31.

This contract provides for the construction of lock No. 17, guard-gates, bridge, retaining walls and one mile of land line through the city of Little Falls and for the construction of a movable crest on the Rocky Rift dam and the superstructure of

400

the Indian Castle guard-gates. The contract was let on September 2, 1908, to Casey & Murray, of Rochester, N. Y.

The work during the past year has included the completion of the Rocky Rift dam, building stairways and doing miscellaneous work at lock No. 17, shaping banks and building dry walls and roadway between lock No. 17 and Seeley island, trimming up prism cuts at Stas. 4300 and 4312, and the completion of prism excavation and retaining walls between old lock No. 38 and the western end of the contract. The coffer-dam in the river within the limits of contract No. 30 was removed in February by the Acme Engineering and Contracting Co. under authority of an extra work order.

Work on this contract is practically completed. There remains to be done only a small amount of cleaning up and the removal of the remaining plant. The contractors deserve especial commendation for having completed within their contract time a difficult piece of construction.

The annual progress on this contract has been as follows: First year, 34.3 per cent; second year, 22.9 per cent; third year, 22.2 per cent; and fourth year, 10.1 per cent; making a total of 89.5 per cent at the time the work was completed.

The engineering work on this contract has been in charge of E. E. Kendall, Assistant Engineer.

The following summary shows the amount of work put under contract and the amount done to September 30, 1912, including alterations and extra work orders:

ITEMS OF WORK.	Preliminary estimate, as affected by alterations to date.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Clearing.....hump sum	\$100	0	\$100	0	100
Excavation.....cu. yds.	243,308	32,949	219,516	13.6	90.2
Removal of dam masonry.....cu. yds.	250	58	129	23.2	51.6
Round bracing.....lin. ft.	1,000	0	0	0	0
Sheeting and bracing.....ft. B. M.	30,000	0	0	0	0
Channeling.....sq. ft.	43,000	0	0	0	0
Embankment.....cu. yds.	15,800	2,176	9,061	13.8	57.3
Lining.....cu. yds.	3,320	1,589	3,818	47.9	115
Puddle.....cu. yds.	740	0	513	0	69.3
Sawed lumber.....ft. B. M.	76,000	11,400	66,500	15.0	87.5
White oak timber in miter-sills and gates, ft. B. M.	4,500	*1,318	3,377	*29.3	75
Sawed lumber in needles.....ft. B. M.	7,000	6,735	6,735	96.2	96.5
Round timber.....lin. ft.	5,300	155	2,753	2.9	51.9
Second-class concrete.....cu. yds.	58,830	2,994	53,570	5.1	91.1
Reinforced concrete.....cu. yds.	387	0	283	0	73.1

ITEMS OF WORK.		Preliminary estimate, as affected by alterations to date.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
First-class masonry coping	cu. yds.	3	0	2 31	0	77
Dry retaining wall, including coping	cu. yds.	5,910	1,213	5,470	20 5	92 6
Third-class stone paving	sq. yds.	168	25	140	14 9	83 3
Cobblestone paving	sq. yds.	180	0	109	0	60 5
First-class riprap	cu. yds.	230	55	117	23 9	50 9
Fourth-class riprap	cu. yds.	12,400	3,615	8,003	20 2	64 5
Structural steel	lbs.	155,485	15,218	158,066	9 8	101 7
Metal reinforcement	lbs.	101,230	4,150	106,780	4 1	105 4
Iron castings, plain	lbs.	26,800	300	23,172	1 2	86 5
Iron castings, machined	lbs.	13,000	0	12,648	0	97 3
Metal in upper lock-gates	lbs.	138,000	0	137,442	0	99 6
Metal in lower lock-gates	lbs.	430,000	0	423,111	0	98 4
Metal in buffer-beams	lbs.	80,000	9,119	80,012	11 4	100 01
Metal in lock-valves	lbs.	60,000	0	58,168	0	93 6
Metal in guard-gates	lbs.	680,000	44,566	661,361	6 6	97 3
Wooden fence	lin. ft.	1,500	0	851	0	56 7
Wrought iron pipe railing	lin. ft.	1,080	520	906	49	92 2
Lattice railing	lin. ft.	184	0	181	0	98 4
Filling seams	lin. ft.	2,500	0	0	0	0
Repointing old masonry	lin. ft.	3,000	0	1,305	0	46 5
Storehouses	No.	2	0	2	0	100
Coffer-dams, pumping, bailing, etc.	lump sum	\$12,000	\$4,560	\$11,160	38	93
Drilling bolt holes in rock	lin. ft.	650	49	40	7 5	7 5
Raising bridge superstructure	lump sum	\$1,800	0	\$1,800	0	100
Maintaining highway traffic	lump sum	\$1,000	\$500	\$1,000	50	100
Maintaining navigation	lump sum	\$1,000	\$500	\$1,000	50	100
Deduct for buildings removed	lump sum	\$3,500	0	\$3,500	0	100
Deduct for bridge superstructures removed,	lump sum	\$50	0	\$50	0	100
Extra Work Order.						
Bracing timber tow-path	lump sum			\$450		100
Drilling and furnishing material for electric wire ducts	lump sum			\$316		100
Removal of Reddy building	lump sum			\$175		100
Concrete foundation for dry wall	lump sum			\$34 10		100

* A decrease.

Contract No. 30.

This contract extends westward from contract No. 31 and includes 3.1 miles of river line to Jacksonburg, 4.2 miles of land line to Herkimer, 4.4 miles of river line to Frankfort and 3 miles of land line to a point one-half mile east of Sterling creek. The contract includes lock No. 18 at Jacksonburg, guard-gates and a movable dam at Herkimer, a retaining dam at Frankfort, five bridges, retaining walls and incidental work. The contract was let on July 16, 1909, to the Acme Engineering and Contracting Company, now of Herkimer, N. Y. Work was begun in October, 1909.

River prism, Little Falls to Jacksonburg. Rock excavation in the river bottom for a distance of about 700 feet at the extreme eastern end of the contract has been completed. Coffer-dams have been built across the river and the river turned into a

11, at Little Falls, before beginning of construction.

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temporary channel at a point about one-half mile west of Little Falls. Trouble has been experienced through the flooding of the coffer-dam and only 11,500 cu. yds. have been removed of the total of 60,000 at this point. During the winter the dredge *General Herkimer* was changed from a combination dipper and suction dredge to a standard 16-in. hydraulic dredge. Good progress has been made by this dredge on the work between Little Falls and Jacksonburg.

Lock No. 18, Jacksonburg. Concrete has been completed and steel work erected. The lock is completed except for about one-half of the backfill.

Land line, Jacksonburg to Herkimer. Some excavation has been made and a considerable amount of wash wall laid. The change in plans, from a retaining wall with standard slopes behind and above it to flatter slopes without a retaining wall, has delayed work at the heavy cut near Washington street.

Dam No. 14 and guard-gate, Herkimer. One-half of the dam has been completed. The guard-gate is about two-thirds built. Work is in progress on the crossing of the Utica and Mohawk Valley Railway Co. Both the highway and the trolley bridge should be in use before January 1.

River prism, Herkimer to Frankfort. The 20-in. hydraulic dredge *DeWitt Clinton* has excavated from Frankfort to a point one-half mile west of Herkimer. Some work has been done at the bridges at Ilion and Frankfort.

Land line, Frankfort to Sterling creek. A small amount of dredging has been done and most of the canal slopes trimmed. The connection between the river and the canal near Sta. 5090 has been closed. The south abutment of the East Schuyler bridge is nearly completed.

During the first year of this contract 8.2 per cent was done, during the second 28.4 per cent, and during the third 20.7 per cent, making a total of 57.3 per cent completed to September 30, 1912. This contract will overrun the time limit. Fair progress has been made, however, the monthly estimates averaging about \$90,000 for the working months.

A considerable amount of field work has been done on appropriation surveys and running final location lines.

The engineering work on this contract has been in charge of George L. Oakley, Resident Engineer.

The following summary shows the amount of work put under contract and the amount done to September 30, 1912, including alterations in force and extra work orders:

ITEMS OF WORK.	Preliminary estimate, by authority.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Clearing..... lump sum	\$1,000	540	540	41	98
Grubbing..... cu. yds.	20,700	11,344	21,848	37.9	83.5
Excavation..... cu. yds.	5,418.131	1,430.03	5,567.053	26.4	65.5
Sheeting and bracing..... ft. B. M.	106,000	11,800	11,800	11	11
Round timber bracing..... bn. ft.	1,000	1,115	1,115	111.5	111.5
Forming embankment..... cu. yds.	538,000	61,007	1,000,021	12.1	31.6
Lining..... cu. yds.	5,725	40	1,204	8.2	21
Puddle..... cu. yds.	300	17	17	5.7	5.7
Sawed lumber..... ft. B. M.	104,300	561	9,028	0.54	8.7
Sawed lumber in lock-needles..... ft. B. M.	10,000	0	0	0	0
White oak in miter-sills and gates..... ft. B. M.	9,000	7,735	7,735	85.9	85.9
Foundation piles..... lin. ft.	41,762	13,452	13,452	32.2	32.2
Wooden sheet-piling..... ft. B. M.	706,000	276,526	276,526	39.2	39.2
First-quality steel piling..... sq. ft.	8,600	3,418	7,018	39.7	81.6
Second-quality steel piling..... sq. ft.	110,000	0	0	0	0
Second-class concrete..... cu. yds.	37,927	5,500	23,050	14.8	64.7
Third-class concrete..... cu. yds.	130	70.5	70.5	54.2	54.2
Second-class reinforced concrete..... cu. yds.	746	20	488	2.7	65.4
First-class masonry coping..... cu. yds.	5.5	0	0	0	0
Dry retaining wall..... cu. yds.	5,540	920	4,132	16.6	71.6
Wash wall..... cu. yds.	45,850	5,699	6,061	12.4	13.7
First-class stone paving..... sq. yds.	3,350	0	0	0	0
Second-class stone paving..... sq. yds.	340	0	0	0	0
Third-class stone paving..... sq. yds.	623	0	0	0	0
Cobblestone paving..... sq. yds.	410	0	0	0	0
First-class riprap..... cu. yds.	2,000	650	650	31.1	31.1
Second-class riprap..... cu. yds.	2,160	0	0	0	0
Third-class riprap..... cu. yds.	2,194	102	102	4.6	4.6
Fourth-class riprap..... cu. yds.	20,034	1,881	1,881	6.5	6.5
Structural steel..... lbs.	1,034,050	21,430	34,650	2.1	3.4
Metal reinforcement..... lbs.	76,580	7,541	30,120	9.9	51.1
Iron castings, plain..... lbs.	33,800	4,001	4,406	12.1	13
Iron castings, machined..... lbs.	9,850	2,755	8,920	24	90.6
Metal in lock-gates..... lbs.	260,000	233,530	234,286	89.8	90.1
Metal in buffer-beams..... lbs.	90,000	68,647	72,672	76.3	80.7
Metal in lock-valves..... lbs.	35,000	33,112	33,112	94.6	94.6
Metal in guard-gates..... lbs.	360,000	0	0	0	0
Wooden block pavement..... sq. yds.	300	0	0	0	0
Wooden pavement, 2½ in. thick..... sq. yds.	0	0	0	0	0
Wooden pavement, 3½ in. thick..... sq. yds.	620	9	0	0	0
Wooden fence..... lin. ft.	3,294	0	240	0	7.3
Lattice railing..... lin. ft.	1,044	0	0	0	0
Storehouses..... No.	2	0.90	0.95	45	47.5
Office buildings..... No.	3	0	1	0	3½
Crab..... No.	1	0	0	0	0
Repointing old masonry..... lin. ft.	18,900	0	0	0	0
Maintaining highway traffic..... lump sum	\$5,000	\$1,100	\$3,050	22	61
Maintaining navigation..... lump sum	\$500	0	0	0	0
Coffer-dams, pumping, etc..... lump sum	\$17,000	\$2,380	\$6,630	14	39
Raising bridge superstructure..... lump sum	\$1,000	0	0	0	0
Deduct for bridge superstructures removed, lump sum	\$500	0	0	0	0
Deduct for buildings removed..... lump sum	\$700	\$140	\$700	20	100
<i>Alteration No. 9.</i>					
Additional coffer-dams, etc..... lump sum	\$17,000	\$2,210	\$2,210	13	13
<i>Extra Work Orders.</i>					
Removing coffer-dam, contract No. 31, Hansen avenue.....			\$929.65		100

BARGE CANAL, CONTRACT NO. 31.

Completed work at Little Falls, a short distance west of lock No. 17. Since the whole rise at Little Falls is attained by one new lock in place of four old locks, the water-surface just above the new lock will be considerably higher than the old canal level, as is seen in the view.

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The total work done on Residency No. 4 is summarized by years and contracts in the following table:

CONSTRUCTION WORK.

YEAR ENDING SEPTEMBER 30.	VALUE OF WORK DONE.					Annual totals, whole residency.
	Contract No. 13.	Contract No. 18.	Contract No. 20-A.	Contract No. 31.	Contract No. 30.	
1907.....	.....	\$76,430	.....	.....	.....	\$76,430
1908.....	.....	212,490	.....	.....	.....	212,490
1909.....	.....	92,490	.....	\$284,050	.....	376,540
1910.....	\$9,170	74,610	\$41,730	191,390	\$212,820	529,720
1911.....	762	20,959	77,700	187,520	694,550	981,491
1912.....	.....	.....	179,990	81,080	615,780	876,850
Totals.....	\$9,932	\$476,979	\$299,420	\$744,040	\$1,523,150	\$3,053,521

Work under contract, 70 per cent done.

Total work on residency, about 59 per cent done.

In conclusion I wish to express the appreciation of the engineers on this residency for the fair and liberal treatment which has been accorded them.

ERIE CANAL, RESIDENCY No. 4-A.

Resident Engineer Earle Talbot reports:

This residency, with office at 211 Paul Building, Utica, has supervision over two Erie canal contracts, one of which is in the Eastern Division and the other in the Middle Division. The extent of the residency is from Sta. 5130, near Sterling creek, to Sta. 5775, which is just east of the Oriskany road, a distance of 12.96 miles.

Contract No. 29, Eastern Division, Maryland Dredging and Contracting Company, contractors, extends from near Sterling creek to the Oneida-Herkimer county line, a distance of four miles.

Contract No. 42, Middle Division, now cancelled and to be immediately relet, Shanley-Morrissey, Incorporated, former contractors, extends from the Herkimer-Oneida county line to Oriskany road, a distance of 8.96 miles.

Contract No. 29.

Maurice Williams is Assistant Engineer in charge of this contract, with office attached to the Residency in Utica. The Frank-

fort field office was destroyed by fire, with no serious loss of notes or records, on February 14, 1912.

Work was begun in June, 1909, by the Maryland Dredging and Contracting Company. The contract time for completion was December 31, 1911, but has been extended, owing to alterations in the original contract and delay in the New York Central railroad work east of lock No. 19.

Due to the fact that the construction cost of this contract will underrun the estimates about 10 per cent, the actual relative value of the work performed is 72.5 per cent, whereas the apparent relative value is 65.2 per cent. The contract price has been increased 2.38 per cent by alterations designed to increase the protection against seepage and erosion at lock No. 19, at Sterling creek retaining dam and at six stream entrances, and to provide steel truss approach spans to West Schuyler highway bridge.

The prism excavation east of lock No. 19 was made by the Acme Engineering Company on a subcontract, as far west as the New York Central railroad temporary detour. The detour is still in use, because of the failure of the north abutment of the new railroad bridge at lock No. 19, which occurred during back-filling operations by the railroad contractor on November 6, 1911. This circumstance has delayed all work connected with lock No. 19, for six months.

Concreting at lock No. 19 is nearly complete, including a wing wall into the north bank at the upper thrust wall. The lower gates and buffer-beam are in place, and all concrete and steel work at the lock will be completed this season.

Sterling creek retaining dam is three-fourths complete, and will be finished. Work at this point has been made difficult by flood conditions in the creek, which have washed a large amount of gravel into the prism cut west of lock No. 19.

The dive culvert at Sta. 5214 is complete and considerable embankment has been placed over it. Work has been undertaken at the dive culvert at Sta. 5289. The sheeting and bracing having been placed and excavation, driving foundation piles and concreting the invert are in progress. The length of foundation piles here has been increased to provide additional bearing power.

BARRE CANAL, CONTRACT No. 29.
Abutments for New York Central railroad bridge, at foot of lock No. 10. .

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Sheet-piling has been driven at all stream entrances and these have been excavated preparatory to laying the stone protection, which has been delivered along the contract where called for upon the plans. Some riprap and wash wall have been laid.

A great deal of trimming of the banks along this contract, involving considerable distribution of material, has been done during the year. This work is being progressed at present by steam shovel and trains on the north side of Sterling swamp.

The six-track bridge for the N. Y. C. R. R. main line crossing east of lock No. 19 is in place, and traffic will be diverted over it this year.

The attached table shows the amounts of work done under contract items this year and the total progress of the work to date:

ITEMS OF WORK.	Preliminary estimate, as affected by alterations Nos. 1 to 9.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Clearing.....lump sum		0	95%	0	95
Grubbing.....cu. yds.	61,670	2,610	42,942	4.3	69.7
Excavation.....cu. yds.	1,179,655	116,511	778,209	9.9	66
Sheeting and bracing.....ft. B. M.	180,500	87,400	168,500	48.3	93.4
Round timber.....lin. ft.	1,000	811	1,212	81.1	121.2
Embankment.....cu. yds.	331,557	17,851	246,977	5.4	74.5
Lining.....cu. yds.	2,503	98	1,179	3.9	47.1
Sawed lumber.....ft. B. M.	36,200	0	18,400	0	50.8
White oak lumber.....ft. B. M.	8,000	0	0	0	0
Foundation piles, 12 ft. to 30 ft. long...lin. ft.	12,970	2,460	10,013	19.0	77.3
Wooden sheet-piling.....ft. B. M.	662,800	284,100	514,600	42.8	77.7
Steel sheet-piling.....sq. ft.	5,410	3,640	3,640	67.3	67.3
Second-class concrete.....cu. yds.	34,358	7,670	25,680	22.3	74.8
Second-class reinforced concrete.....cu. yds.	92	0	85	0	92.4
Masonry coping.....cu. yds.	4	0	0	0	0
Wash wall.....cu. yds.	8,900	0	0	0	0
First-class paving.....sq. yds.	2,900	0	0	0	0
Third-class paving.....sq. yds.	300	0	0	0	0
First-class riprap.....cu. yds.	600	0	0	0	0
Second-class riprap.....cu. yds.	670	0	0	0	0
Third-class riprap.....cu. yds.	633	0	0	0	0
Fourth-class riprap.....cu. yds.	6,307	83	96	1.33	1.5
9-in. vitrified pipe.....lin. ft.	31	0	0	0	0
30-in. vitrified pipe.....lin. ft.	41	0	36	0	87.8
Structural steel.....lbs.	412,300	6,602	277,365	1.6	67.2
Metal reinforcement.....lbs.	104,700	29,135	69,378	27.8	66.2
Iron castings, plain.....lbs.	13,600	0	0	0	0
Iron castings, machined.....lbs.	9,500	318	8,582	3.4	90.5
Metal in lock-gates.....lbs.	250,000	140,883	140,883	56.3	56.3
Metal in buffer-beams.....lbs.	78,000	31,125	31,125	39.9	39.9
Metal in lock-valves.....lbs.	35,000	0	0	0	0
Wooden pavement.....sq. yds.	880	0	737	0	83.8
Wooden fence.....lin. ft.	2,390	0	2,074	0	86.8
Maintaining highway traffic.....lump sum		0	80%	0	80
Storehouse.....lump sum		0	0	0	0
Office building.....lump sum		0	100%	0	100
Coffer-dams, pumping, etc.....lump sum		32%	76.5%	32	76.5

Apparent percentage of work completed during the year = 65.2 per cent.
Actual percentage of work completed during the year = 72.5 per cent.

CHAMPLAIN CANAL, RESIDENCY No. 1.

Resident Engineer F. P. Williams reports:

This residency extends from the connection with contract No. 1, north of the guard-lock at Northumberland, to the junction with the Erie canal at Waterford. Length, about 27 miles.

Appropriation surveys. Surveys have been made for 3 parcels of land to be appropriated on contract No. 73 and maps completed for the same. The necessary searches were made in the offices of the county clerks for the above mentioned maps. Also surveys and maps were made for 3 parcels on contract No. 68.

Gage readings. Daily readings of 8 gages between locks Nos. 1 and 2 and one gage above lock No. 2 were continued and plotted on profile; also 7 gages in the vicinity of Stillwater dam. The above readings are taken for the purpose of meeting questions arising from Barge canal construction.

The office work has consisted of work such as checking estimates making miscellaneous computations, drawings, tracings, etc.

Below is given a concise description of the several contracts in this residency:

Contract No. 68 provides for constructing, in the Hudson river, lock No. 3 at Mechanicville, lock No. 4 at Stillwater and lock No. 5 at Northumberland, together with accompanying land lines. Length, about 1.4 miles. Contract price, with alterations, \$1,024,281.85.

Contract No. 69 provides for constructing, in the Hudson river, lock No. 2 below Mechanicville. Length, 0.17 mile. Contract price, \$240,206, as affected by alteration No. 1.

Contract No. 70 is for dredging a channel in the Hudson river and performing incidental work between Waterford and lock No. 1. Length, 3.32 miles. Contract price, \$779,636.50.

Contract No. 71 provides for constructing, in the Hudson river, lock and dam No. 1 above Waterford, and dredging a prism between lock No. 1 and lock No. 2. Length, 3.96 miles. Contract price, \$1,561,119.

Contract No. 72 is for dredging a channel in the Hudson river from lock No. 2 to lock No. 4. Length, 4.1 miles. Contract price, including alterations Nos. 1 and 2, \$1,221,111.75.

Contract No. 73 provides for dredging a channel in the Hudson river and performing work incidental thereto from Stillwater to

Northumberland. Length, 15.0 miles. Contract price, \$518,829, as affected by alterations Nos. 1 and 2.

Contract No. 88 provides for the reconstruction of a portion of the bridge crossing the Hudson river at Schuylerville.

More detailed descriptions of the several contracts are as follows:

Contract No. 68.

The work under this contract was let to Shanley-Morrissey, Inc., November 23, 1908, and the work, which was begun at once, continued uninterruptedly to its completion and final estimates were approved by Canal Board on March 27, 1912. The amount of final estimates is \$946,168, or about 95 per cent of the contract price, taking into consideration the incompleted guide wall at lock No. 3. From September 30, 1911, to the completion of the work in the winter of 1912, work was done on this contract at the following sites:

Lock No. 3. The concrete work in progress at the upper end of the lock at the close of last year's report was continued and all the construction work under the contract, including the erection of gates and valves, was completed during the fall. One block of the upper guide wall was also completed. In November a portion of a coffer-dam for unwatering the balance of the upper guide wall failed, and on account of the lateness of the season the completion of the upper guide wall was abandoned.

During the early part of the winter the plant was removed from the coffer-dam and stored for the winter, work closing down in January, 1912. An alteration was passed by the Canal Board transferring the construction of the balance of the guide wall to contract No. 72, which is adjacent to contract No. 68 and held by same contractor.

A. C. Richards, Assistant Engineer, was in charge of the work.

Lock No. 4. The work being done at this site at the close of last year's report was continued through the fall and winter of 1911-12 and the lock and adjacent prism were completed during the early part of the summer.

The construction plant noted in last year's report has been removed from the site and shipped to other contracts.

R. D. Hayes, Assistant Engineer, was in charge of the work.

Lock No. 5. The work of cleaning up the prism excavation and incidental work at the lock, which was in progress at the close of last year's report, was continued and completed during the fall of 1911, the work being closed down in December, 1911, and plant removed from the site.

L. T. Howard, Assistant Engineer, was in charge of work.

The following table shows the amount of work done during year and to date, with percentages:

ITEMS OF WORK.	Preliminary estimate, as affected by alterations Nos. 1, 2, 3 and 4.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Clearing lump sum		0	100%	0	
Grubbing cu. yds.	4,800	346	3,587	9.6	
Excavation cu. yds.	569,369	8,067	551,449	1.4	
Sheeting and bracing ft. B. M.	a 60,000	0	58,204	0	
Round timber bracing lin. ft.	b 4,000	0	2,984	0	
Channeling sq. ft.	170,000	0	*	0	
Embankment, wet cu. yds.	30,000	1,292	11,026	11.7	
Embankment, dry cu. yds.	42,474	4,119	50,736	8.1	
Lining cu. yds.	510	0	463	0	
Sawed lumber, yellow pine or Douglas fir, ft. B. M.	5,600	1,004	6,144	16.3	
Sawed lumber in needles ft. B. M.	14,000	0	13,049	0	
White oak lumber in miter-sills and gates, ft. B. M.	25,000	3,071	22,758	13.4	
Foundation piles lin. ft.	3,000	0	*	0	
Second-class concrete cu. yds.	65,798	970 8	60,494 8	1.6	
Reinforced concrete cu. yds.	1,460	0	1,309 5	0	
First-class masonry coping cu. yds.	5	2 48	4 48	55.3	
Wash wall cu. yds.	5,362	62	5,358	1.1	
Third-class stone paving sq. yds.	72	0	52	0	
Fourth-class riprap cu. yds.	270	0	0	0	
Structural steel lbs.	180,000	7,084	170,362	4.1	
Metal reinforcement lbs.	58,738	4,647	71,627	6.4	
Iron castings, plain lbs.	23,000	6,237	28,284	22	
Iron castings, machined lbs.	26,000	1,086	25,728	4.2	
Metal in lock-gates lbs.	770,000	91,452	735,587	12.4	
Metal in buffer-beams lbs.	240,000	32,219	223,993	14.3	
Metal in lock-valves lbs.	100,000	15,820	96,736	16.3	
Wooden pavement sq. yds.	360	0	360	0	
Wooden fence lin. ft.	1,200	0	960	0	
Drilling bolt holes in rock lin. ft.	1,372	0	484	0	
Raising bridge superstructures lump sum		0	*	0	
Maintaining highway traffic lump sum		10%	100%	10	
Storehouses No.	3	0	3	0	
Office buildings No.	2	0	2	0	
Coffer-dams, pumping, etc. lump sum		13 72%	100%	13 72	
Taking up and relaying wash wall cu. yds.	1,400	978	973	100	

Contract completed.

* Not required.

a Increased by 10,000 ft. B. M.

b Increased by 3,000 lin. ft.

Contract No. 69.

This contract was let to I. A. Hodge & Co., Inc., December 11, 1909. The work, which was commenced as soon as the contract was let, has continued steadily throughout the fiscal year, some work being done each month.

The construction of the lock, which was nearing completion at the close of last year's report, has been completed during the present summer, with the exception of the power house. The construction of the power house was commenced at the close of this year's report.

The construction of a bridge across the power tail race and lower end of lock, which was just commenced at the end of last year's report, was completed during the fall and winter.

The construction of a portion of the upper guide wall, which was uncompleted at the end of last year's report, has been commenced during the present summer, and six feet of the foundation placed under water.

Preparations are in progress at the present time to complete during the fall of 1912 the balance of the power house and the upper guide wall, and also the sundry small work incidental to completing the contract, the principal item of which is the storehouse.

During the year alteration No. 1, providing for changing the location of the power house twenty feet downstream, was issued. Also an extension to October 1, 1912, of time was granted contractors.

F. S. Crowell, Assistant Engineer, was in charge of the contract to April 15, when he was transferred to the Terminal work. Since that date the work has been in charge of B. T. Kenyon, Assistant Engineer.

The following table shows the amount of work done during the year and to date, with percentages:

ITEMS OF WORK.	Preliminary estimate, as affected by alterations.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Clearing.....lump sum		0	100%	0	Finished
Excavation.....cu. yds.	77,200	4,917	63,434	6.3	82.2
Sheeting and bracing.....ft. B. M.	5,000	0	3,140	0	62.8
Round timber bracing.....lin. ft.	500	0	423	0	84.6
Forming embankment.....cu. yds.	100	0	0	0	0
Sawed lumber, yellow pine or Douglas fir ft. B. M.	6,000	4,150	4,150	69.2	69.2
White oak lumber in miter-sills and lock-gates ft. B. M.	9,000	7,895	7,895	87.7	Finished
Second-class concrete.....cu. yds.	19,946	2,759	18,646	13.8	93.4

ITEMS OF WORK.	Preliminary estimate, as affected by alterations.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Second-class reinforced concrete.....cu. yds.	615	18	48	29.3	78.1
First-class masonry coping.....cu. yds.	2				
Third-class stone paving.....sq. yds.	200				
Third-class riprap.....cu. yds.	100				
Fourth-class riprap.....cu. yds.	100				
Structural steel.....lbs.	183,370	166,501	168,161	90.8	91.7
Metal reinforcement.....lbs.	17,670	2,047	10,650	11.6	60.3
Iron castings, plain.....lbs.	7,600	3,590	3,830	47.2	50.4
Iron castings, machined.....lbs.	8,600	4,120	8,240	47.8	95.8
Metal in lock-gates.....lbs.	260,000	241,079	241,802	92.6	92.9
Metal in buffer-beams.....lbs.	77,000	67,754	73,091	88	95
Metal in lock-valves.....lbs.	34,000	22,609	32,016	87.2	94.1
Wooden pavement.....sq. yds.	440	427	427	97	97
Wooden fence.....lin. ft.	340				
Drilling bolt holes in rock.....lin. ft.	†490	0	426	0	86.9
Coffer-dams, pumping, bailing and draining lump sum		15%	60%	15	60
Office building.....lump sum		0	100%	0	Finished
Storehouse.....lump sum		0	0	0	0

† Increased by 180 lin. ft.

Contract No. 70.

This contract was let January 11, 1910, to Shanley-Morrissey, Inc., of New York. The work in progress at the close of last year's report, namely, the excavation of about 500 feet of prism at the north end of the contract by steam shovel and cars, by a subcontractor, the Merion Construction Co., was commenced during the fall of 1911 and completed, the plant being withdrawn.

The other work in progress during the fiscal year consisted of a small amount of excavation by a tower scraper in the back channel at the north end of the contract. This work was closed down in December, 1911. Since that time there has been no work in progress.

R. D. Hayes, Assistant Engineer, was in charge of above work.

On May 8, 1912, the work on the contract was suspended by order of the Canal Board, the contractors entering into bankruptcy.

On July 18, 1912, the contract was cancelled.

On September 24, 1912, bids were opened, plans having been revised for a reletting of the work. One bid was received, and this was below the engineer's estimate.

The following table shows the amount of work done during the year and to date, with percentages:

ITEMS OF WORK.	Preliminary estimate.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Clearing.....lump sum		0	65%	0	65
Excavation.....cu. yds.	757,600	19,559	237,213	2.6	31.3
Sheeting and bracing.....ft. B. M.	2,000	0	0	0	0
Forming embankment.....cu. yds.	300	0	0	0	0
Lining.....cu. yds.	210	0	0	0	0
Second-class concrete.....cu. yds.	140	0	0	0	0
Wash wall.....cu. yds.	10,490	0	0	0	0
First-class riprap.....cu. yds.	200	0	0	0	0
Second-class riprap.....cu. yds.	200	0	0	0	0
Third-class riprap.....cu. yds.	200	0	0	0	0
Fourth-class riprap.....cu. yds.	400	0	0	0	0
Iron castings, plain.....lbs.	6,500	0	0	0	0

Contract No. 71.

This contract was let to Shanley-Morrissey, Inc., January 11, 1910, and work, which was commenced soon after the letting of the contract, continued up to February of 1912, when all work was closed down. No work has been done since.

On May 8, 1912, work on this contract was suspended by order of the Canal Board, the contractors entering into bankruptcy.

On August 8, 1912, the contract was cancelled by order of the Canal Board.

Plans were made for reletting, which took place September 24, 1912. No bids were received.

A final estimate, etc., of the work of Shanley-Morrissey, Inc., has been made. The following gives a short account of the main work in progress at the various points on this contract during the fiscal year:

At the excavation work below lock No. 2 from Sta. 1045 to Sta. 1050, just commenced by subcontractor I. A. Hodge & Co., Inc., at the close of last year's report, the gravel was stripped from the rock with steam-shovel plant inside of coffer-dam. Some of the rock was blasted and removed, but the flood of October 20 submerged the work, and nothing further was done in finishing this section of work. The coffer-dam was subsequently repaired and plant removed the first of December.

At the coffer-dam, Sta. 1082 to Sta. 1094, which was just

nearing completion at the close of last year's report, the prism was unwatered and the excavation of this section, amounting to about 62,000 yards, was practically completed the first part of February, 1912, with steam-shovel plant. A flood in October delayed work about one month.

At Sta. 1137 south, the work of drilling and blasting inside of coffer-dam, which was in progress on October 1, 1911, was submerged by high water on October 20, 1911, and not again resumed.

At lock No. 1, under subcontract to Merion Construction Co., the construction of the lock was continued during the fall of 1911 until December, when the work was submerged by flood and not resumed.

During the fall, the balance of the west wall, the upper cross wall and the upstream half of east wall were completed and upper needle dam swung.

R. D. Hayes, Assistant Engineer, was in charge of the contract.

The following table shows the amount of work done during the year and to date, with percentages:

ITEMS OF WORK.		Preliminary estimate.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Clearing	lump sum		0	50%	0	50
Excavation	cu. yds.	690,000	68,373	380,976	10	56
Sheeting and bracing	ft. B. M.	20,000	0	0	0	0
Round timber bracing	lin. ft.	500	0	0	0	0
Channeling	sq. ft.	22,000	0	0	0	0
Forming embankment	cu. yds.	320	0	0	0	0
Lining	cu. yds.	100	0	0	0	0
Sawed lumber, yellow pine or Douglas fir	ft. B. M.	1,500	0	0	0	0
White oak lumber in miter-sills and lock-gates	ft. B. M.	8,000	0	0	0	0
Concrete	cu. yds.	27,300	4,907	10,889	18	39.9
Reinforcing concrete	cu. yds.	320	0	0	0	0
Gravel	cu. yds.	420	0	0	0	0
Gravel	cu. yds.	490	0	0	0	0
Gravel	cu. yds.	300	0	0	0	0
Gravel	cu. yds.	1,480	0	0	0	0
Gravel	cu. yds.	300	0	0	0	0
Gravel	cu. yds.	880	0	0	0	0
Gravel	lbs.	18,800	2,928	5,917	15.8	32
Gravel	lbs.	41,500	845	2,177	2	5.2
Gravel	lbs.	18,700	1,820	1,820	11.8	11.8
Gravel	lbs.	8,600	3,769	5,817	43.7	67.6
Gravel	lbs.	238,000	439	439	0.2	0.2
Gravel	lbs.	78,000	22,781	33,176	42	42.5
Gravel	lbs.	33,000	96	179	0.3	0.5
Rock	lin. ft.	1,100	0	0	0	0
Gravel, bailing and draining	lump sum		11.59%	36.94%	11.59	36.94
Office building	lump sum		0	100%	100	100
Storehouse	lump sum		0	0	0	0
Deduct for buildings	lump sum		80%	80%	80	80

Contract No. 72.

This contract was let to Shanley-Morrissey, Inc., December 14, 1909, and work, which was commenced at once, was continued to about the first of January, 1912. Since that time there has been no construction work in progress. A small force of men have been employed in caring for plant.

On May 8, 1912, the work was suspended by order of Canal Board, the contractors entering into bankruptcy.

On July 18, 1912, the contract was cancelled by order of Canal Board.

On September 24, 1912, bids were opened for reletting the work, plans having been made for that purpose. One bid was received from James Stewart, amounting to \$1,539,312. The engineer's estimate was \$1,125,036.

A final estimate of the work of Shanley-Morrissey, Inc., has been made.

The following is a summary of the work in progress at the various points on the contract during the fiscal year:

The prism excavation inside of coffer-dam between Sta. 841 and 855, the work of unwatering same being in progress at the close of last year's report, was unwatered the early part of October, 1911, but on account of weakness of one section of the coffer the work was submerged soon after excavation was commenced. On account of damage to the coffer by the flood of October 20, no attempt was made to resume work at this point. Later an unsuccessful attempt was made to remove the steam-shovel submerged in the coffer-dam.

The hydraulic dredge continued working in the fall of 1911, excavating for channel and filling coffer-dam until December, when it was laid up at lock No. 3 in winter quarters. In March, 1912, this dredge sank in the lock chamber and has remained submerged since.

At Hart's coffer-dam, at lower Mechanicville, the excavation of prism with dipper-dredge and cars was continued during the fall of 1911 until December 23, when the coffer-dam broke and further

excavation was abandoned. There was about a week's delay on account of floods in October.

During the first part of the year the plant was removed from the river, the coffer-dam was strengthened and work closed down.

Since that time no work has been in progress. A small force has been employed in caring for the plant.

H. W. Hale, Assistant Engineer, has been in charge of this contract.

The following table shows the amount of work done during the year and to date, with percentages:

ITEMS OF WORK.	Preliminary estimate, as affected by alterations.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Clearing lump sum		0	90%	0	90
Excavation cu. yds.	955,000	81,349	492,061	8 6	51.5
Sheeting and bracing ft. B. M.	2,000	0	0	0	0
Round timber bracing lin. ft.	400	0	0	0	0
Stone filling in cribs cu. yds.	2,400	0	0	0	0
Rock spoil filling cu. yds.	1,000	0	0	0	0
Structural steel lbs.	9,000	0	0	0	0
Iron castings, plain lbs.	5,800	0	0	0	0
Sawed lumber, yellow pine or Douglas fir ft. B. M.	180,000	0	0	0	0
Upper guide wall, lock No. 3 lump sum		0	0	0	0

Contract No. 73.

This contract was let to E. M. Graves, May 26, 1910, and the work of constructing dredges began within a short time and contract work, commenced in 1910, continued until December, 1911, when the dredges were laid up for the winter.

In December, 1911, an alteration was made, eliminating the uncompleted portions of the work. Final estimates were made of work done to the close of the year 1911.

The following is a summary of the work in progress during the fiscal year:

The dipper and hydraulic dredges continued excavating the channel between the Schuylerville bridge and lock No. 5 until the work closed down for the winter in the early part of December, when the dredges were laid up in winter quarters below lock No. 5.

L. T. Howard, Assistant Engineer, was in charge of this contract.

The following table shows the amount of work done during the year and to date, with percentages:

ITEMS OF WORK.	Preliminary estimate, as affected by alterations.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Clearing.....lump sum	a75%	50%	75%	66 6	100
Excavation.....cu. yds.	960,889	186,777	957,471	19 4	100
Sheeting and bracing.....ft. B. M.	8,618	0	8,618	0	100
Round timber bracing.....lin. ft.	68	0	68	0	100
Forming embankment.....cu. yds.	9,163	1,066	10,234	11 6	100
Lining.....cu. yds.	0	0	0	0	0
Sawed lumber, yellow pine or Douglas fir.....ft. B. M.	0	0	0	0	0
Wooden sheet-piling.....ft. B. M.	0	0	0	0	0
Second-class concrete.....cu. yds.	2,020	30 6	2,021 6	1 5	100
Second-class reinforced concrete.....cu. yds.	0	0	0	0	0
Wash wall.....cu. yds.	0	0	0	0	0
Second-class stone paving.....sq. yds.	0	0	0	0	0
First-class riprap.....cu. yds.	0	0	0	0	0
Second-class riprap.....cu. yds.	0	0	0	0	0
Third-class riprap.....cu. yds.	0	0	0	0	0
Fourth-class riprap.....cu. yds.	0	0	0	0	0
Structural steel.....lbs.	1,463	0	1,463	0	100
Metal reinforcement.....lbs.	862	0	862	0	100
Iron castings, plain.....lbs.	0	0	0	0	0
Wooden pavement.....sq. yds.	0	0	0	0	0
Wooden fence.....lin. ft.	0	0	0	0	0
Drilling bolt holes in rock.....lin. ft.	248	0	248	0	100
Moving bridge at lock No. 5.....lump sum	0	0	0	0	0
Moving bridge superstructures.....lump sum	0	0	0	0	0
Maintaining highway traffic.....lump sum	0	0	0	0	0
Maintaining navigation.....lump sum	0	0	0	0	0
Coffer-dams, pumping, bailing and draining.....lump sum	b33%	33%	33%	100	100
Deduct buildings in place, etc.....	c22%	22%	22%	100	100

a Deduct for clearing not required, 25 per cent.
b Deduct for coffer-dams, etc., not required, 67 per cent.
c Add for buildings not required, 73 per cent.

Contract No. 88.

This contract, which requires the reconstruction of a portion of the bridge crossing the Hudson river at Schuylerville, was let to Lathrop, Shea & Henwood Co., November 4, 1911.

Work was commenced in April, 1912, with the fabrication of steel and the unloading of plant at the site. As soon as the spring floods receded in June, piling was driven for caisson for west pier. This pier was completed in September. The steel for the bridge has been delivered at the site. At the close of the fiscal year preparations were in progress for building the east pier. During the summer, the highway traffic has been maintained by ferry, a short distance above the bridges.

An extension of time for completing the contract was granted, extending the time from June 1, 1912, to September 15. An additional extension of time will be necessary.

In excavating the foundation pits for piers soft sand and clay were encountered, on account of which an alteration was passed by the Canal Board, changing the original plans so as to include a pile foundation.

W. T. Hunt, Leveler, is in charge of this contract.

The following table shows the amount of work done during the year and to date, with percentages:

ITEMS OF WORK.	Preliminary estimate, as affected by alterations.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Excavation..... cu. yds.	2,600	511	511	19.6	19.6
Sheeting and bracing..... ft. B. M.	10,000	0	0	0	0
Round timber bracing..... lin. ft.	1,000	0	0	0	0
Sawed lumber..... ft. B. M.	18,800	0	0	0	0
Second-class concrete..... cu. yds.	900	376	376	41.7	41.7
Fourth-class riprap..... cu. yds.	70	0	0	0	0
Structural steel..... lbs.	161,700	25	25	0	0
Metal reinforcement..... lbs.	600	270	270	45	45
Iron castings, plain..... lbs.	2,600	608	608	23.4	23.4
Wooden pavement..... sq. yds.	352	.....	.....	0	0
Coffer-dams, pumping, bailing and draining					
..... lump sum		50%	50%	50	50
Maintaining highway traffic..... lump sum		50%	50%	50	50
Rebuilding spans 2 and 6..... lump sum		0	0	0	0
Raising spans 1, 7 and 8..... lump sum		0	0	0	0
Removing bridge superstructure..... lump sum		0	0	0	0
Foundation piles..... lin. ft.	3,120	0	0	0	0
Wooden sheet-piling..... ft. B. M.	28,800	0	0	0	0

CHAMPLAIN CANAL, RESIDENCY NO. 2.

Resident Engineer E. V. R. Payne reports:

Residency No. 2, Champlain canal, extends from the North-umberland bridge across the Hudson river northerly to the highway bridge at Dunhams Basin, Washington county, and includes the Glens Falls feeder and dam.

The following contracts are located within the confines of this residency: Nos. 1, 3, 3-A, 24, 26, 27, 27-A, 54 and 56, and portions of Nos. 7, 16, 32 and 92.

Contracts Nos. 3, 3-A, 26, 27, 7 and 32 have been completed, and during the past year active work has been done on Nos. 24, 27-A, 54 and 16.

The work has consisted of general office work, revising appropriation maps on contract No. 1 for flooded farms along the Hudson river, compiling data for Board of Claims, preparation of final estimates on contracts Nos. 1, 27-A and 54, and construction operations on contracts Nos. 24, 27-A, 54 and 16.

Contract No. 1.

This contract provides for excavating the river channel from Northumberland to Fort Miller and from Crocker's Reef to Fort Edward; the construction of Crocker's Reef dam; the approaches to the head and foot on the "land line" and other incidental work. Length, 7.075 miles. Edward W. Wendell, Assistant Engineer. Empire Engineering Corporation, contractor.

No work of any kind has been done on this contract during the year.

Contract No. 16 (on Contract No. 27-A).

This contract provides for furnishing and erecting in place steel highway bridges. R. G. Gibson, Assistant Engineer. The United Construction Company, contractor.

With the exception of the Dunhams Basin bridge, which was finished in 1909, all bridges on this contract, incorporated under contract No. 27-A and located at East street, Argyle street and lower Broadway, were erected complete during the year.

An alteration providing 60-foot girder approach spans at both ends of East street bridge and at the east end of Argyle street bridge was necessitated on account of deepening the foundations to these abutments; to be done under contract No. 27-A.

The following is a summary of items on contract No. 16 (contract No. 27-A), as modified by alterations Nos. 2 and 4, to September 30, 1912:

ITEMS OF WORK.	Preliminary estimate, as affected by alterations.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Structural steel.....lbs.	819,500	459,306	570,993	56	69.7
Sawed lumber, yellow pine or Douglas fir ft. B. M.	78,300	32,000	41,100	40.9	52.5
Sidewalk railing.....lin. ft.	598	183	183	30.6	30.6
Setting stone coping.....cu. yds.	8 2	1	3	12.2	36.6
Lining.....cu. yds.	8	0	2	0	25

Contract No. 24.

This contract provides for constructing a guard-gate at Crocker's Reef. Length, 0.19 mile. Edward W. Wendell, Assistant Engineer. Kingsbury Construction Company, contractor.

This contract was awarded to James D. Sherrill, of Hudson Falls, N. Y., on November 1, 1911, for \$44,368. Work was started immediately and continued until the following March (1912), during which time 3,564 cu. yds. of earth and rock were excavated, 431 cu. yds. of embankment made and 1,080 cu. yds. of wash wall laid.

Later, on June 3, 1912, the contract was assigned to the Kingsbury Construction Company, of Hudson Falls, N. Y. Work was resumed on June 15 and has progressed since that time. The west guide wall to the guard-gate and the abutment supporting the west tower have been practically completed, including excavation in the rock for the foundations.

The following is a summary of items on contract No. 24 to September 30, 1912:

ITEMS OF WORK.	Preliminary estimate.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Excavation.....cu. yds.	13,200	7,089	7,089	53.7	53.7
Forming embankment.....cu. yds.	2,640	641	641	24.2	24.2
White oak lumber.....ft. B. M.	500	0	0	0	0
Second-class concrete.....cu. yds.	1,784	1,379	1,379	77.3	77.3
Wash wall.....cu. yds.	2,630	1,679	1,679	63.8	63.8
Metal reinforcement.....lbs.	50	0	0	0	0
Metal in sluice-gates.....lbs.	11,000	0	0	0	0
Metal in guard-gate.....lbs.	199,000	0	0	0	0
Gate hoists.....No.	2	0	0	0	0

Contract No. 27-A.

This contract provides for completing the construction of the canal from the south end of Contract No. 25, at Dunhams Basin road, to the Hudson river, at Fort Edward. Length, 3.76 miles. R. G. Gibson, Assistant Engineer. Holler & Shepard, contractors.

The principal features of this contract are lock No. 8, including

substructure for power house, the junction lock, four Barge canal bridge abutments, two plate girder bridges and abutments over Bond creek, one siphon spillway, two dive culverts, embankment and wash wall for the entire length of contract and leveling of spoil banks.

Excavation has been made chiefly for the foundation to the southwest approach wall and prism in the lower pool at lock No. 8; also about two-thirds of the block of material south of Argyle street and smaller amounts in the bridge abutments and in prism at the south end of contract.

The excavation of spoil banks has been finished from the north end of the contract, on both sides, for 2,000 feet, and from the south end of lock No. 8 southerly to Argyle street. Part of this material has been used to form embankment on the west bank of the canal.

Drilling has been started in the rock ledge in the lower pool to lock No. 8, but no material has been excavated.

The rock spoil taken from lock No. 8 excavation was used to backfill the east wall and the west wall was backfilled with material taken from the upper pool, leaving the lower approach wall yet to be backfilled.

During the year, at lock No. 8, the southwest approach wall and needle beam section, power-house substructure and cut-off wall were completed, as was also the northwest approach wall to lock No. 7.

Abutments for Argyle street and lower Broadway bridges and for the bridge at Baldwin avenue over Bond creek have been completed.

The two dive culverts, the outlet to the siphon spillway and the southeast approach wall to lock No. 8 remain to be built.

Wash wall has been placed, on both sides, from the south end of lock No. 8 approach walls to East street, but none finished.

Plate girder bridges over Bond creek have been placed at East street and Baldwin avenue.

The cast iron pipe has been delivered for the two dive culverts, but not placed.

The following is a summary of items on contract No. 27-A, as modified by alterations Nos. 1, 2, 3, 4 and 5, to September 30, 1912:

ITEMS OF WORK.	Preliminary estimate, as affected by alterations.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Clearing.....	lump sum	21 9%	65.7%	21 9	65 7
Grubbing.....	cu. yds. 8,350	1,518	4,390	18 2	52 6
Excavation from spoil banks.....	cu. yds. 182,000	85,829	121,710	47.2	66 9
All other excavation.....	cu. yds. 353,980	58,216	93,201	16 4	26 3
Sheeting and bracing.....	ft. B. M. 240,000	78,900	78,900	32.9	32 9
Forming embankment.....	cu. yds. 152,310	29,505	60,446	19.4	39 7
Gravel lining.....	cu. yds. 3,870	0	0	0	0
Sawed lumber.....	ft. B. M. 34,000	15,640	15,640	45 9	45 9
Yellow pine in lock-gates.....	ft. B. M. 7,000	6,440	6,440	92	92
White oak.....	ft. B. M. 300	180	180	60	60
Foundation piles, 15 ft. long.....	No. 860	441	509	51 3	59 2
Foundation piles, 20 ft. long.....	No. 1,050	420	555	40	52 8
Sheet-piling.....	ft. B. M. 489,750	73,550	74,100	15	15 1
Second-class concrete.....	cu. yds. 14,470	5,261	9,924	36.4	68 6
Reinforced concrete.....	cu. yds. 1,072	854	974	79 7	90 8
Finishing concrete surfaces.....	sq. ft. 10,000	0	0	0	0 6
Masonry bridge coping.....	cu. yds. 14	12	12	85.7	85 7
Wash wall.....	cu. yds. 27,360	7,030	9,367	25 7	34.2
Second-class stone paving.....	sq. yds. 714	51	51	7.1	7.1
Third-class riprap.....	cu. yds. 510	0	0	0	0
15-inch vitrified pipe.....	lin. ft. 40	0	0	0	0
Structural steel.....	lbs. 188,200	155,073	162,954	82 4	86 6
Metal reinforcement.....	lbs. 69,650	44,459	58,169	63.8	83 5
Cast iron pipe.....	lbs. 225,200	0	0	0	0
Iron castings.....	lbs. 40,600	3,882	4,993	9.6	12 3
Wooden pavement.....	sq. yds. 0	0	0	0	0
Wooden fencing.....	lin. ft. 5,160	0	0	0	0
Lattice railing.....	lin. ft. 265	242	242	91.3	91.3
Removing three old bridge superstructures,	lump sum	0	0	0	0
Maintaining traffic.....	lump sum	34%	38%	34	38
Sluice-gate.....	lump sum	0	0	0	0
Lowering Argyle street bridge.....	lump sum	0	0	0	0
Maintaining traffic over Bond creek.....	lump sum	36½%	53½%	36½	53½
Foundation piles.....	lin. ft. 10,500	0	0	0	.....

Contract No. 54.

This contract provides for constructing lock No. 7, at Fort Edward, on the Hudson river, where the Champlain canal enters the "land line" extending to Whitehall. Length 0.22 mile. Clinton A. Curtis, Assistant Engineer. Hunkin-Conkey Construction Company, contractor.

The upper approach wall to the lock (No. 7) was completed at the beginning of the fiscal year, October 1, 1911.

A coffer-dam of steel sheet-piles was built around the entire lock, but considerable time was lost, owing to the collapse of the dam. Longer sheet-piles were driven and reinforcing cables were anchored to pile clusters in the river and on the island, and this

arrangement proved adequate to withstand the ordinary high water. This dam was unwatered and the lock foundation was excavated by a McMyler and clam-shell bucket. Then piles were driven in a very hard gravelly deposit. Along the shore of the former river bed hardpan was encountered. This work continued until the latter part of February, when the frost became so deep that it was impracticable to drive piles.

Five sections of the wall foundation were built under the west wall of the lock in March prior to the 19th, when the river flooded the coffer-dam. Regular construction work was resumed on May 15, 1912, and has continued, with rapid progress, to practical completion. About 600 cu. yds. of concrete remain to be placed.

Concrete was placed in the lock walls, in 1912, by chutes from a central tower located on the banks of the Champlain canal opposite the center of the lock.

Riprap has been placed on the embankment back of the upper approach wall, to protect it from the erosion of the river at the sharp bend at this point.

The excavation of the prism north of the lock is 90 per cent completed.

The lock gates and steel work were completed during the summer.

The following is a summary of items on contract No. 54, as affected by alterations Nos. 1 and 2, to September 30, 1912:

ITEMS OF WORK.	Preliminary estimate, as affected by alterations.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Excavation.....cu. yds.	45,600	15,296 ^a	29,943	33.5	65.69
Sheeting and bracing ^a.....ft. B. M.	14,000	0	9,335	0	66.6
Forming embankment.....cu. yds.	11,300	525	8,851	4.6	78.3
Sawed lumber, yellow pine or Douglas fir ft. B. M.	1,100	0	0	0	0.1
Sawed lumber in needles.....ft. B. M.	16,000	0	0	0	0
White oak lumber in miter-sills, lock-gates and buffer-blocks.....ft. B. M.	6,800	4,880	4,880	74.7	74.7
Foundation piles, 16 ft. to 30 ft. long.....lin. ft.	60,600	31,606	53,244	52.3	87.8
Mooring piles, 20 ft. long.....lin. ft.	130	0	0	0	0
Wooden sheet-piling.....ft. B. M.	225,000	102,060	247,068	45.3	109.8
Second-class concrete ^b.....cu. yds.	21,925	14,714	19,322	67.1	88.1
Wash wall.....cu. yds.	600	0	0	0	0
Second-class riprap ^c.....cu. yds.	0	0	0	0	0

^a Amount of sheeting and bracing increased from 2,000 ft. B. M. to 14,000 ft. B. M. by resolution of Canal Board dated April 6, 1911.

^b Amount of second-class concrete increased from 21,700 cu. yds. to 21,925 cu. yds. by resolution of Canal Board, dated September 10, 1912.

^c Second-class riprap eliminated from contract by resolution of Canal Board, dated September 10, 1912.

ITEMS OF WORK.	Preliminary estimate, as affected by alterations.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Third-class riprap cu. yds.	3,660	2,142	2,142	58.5	58.5
Structural steel lbs.	7,200	6,104	6,104	84.7	84.7
Metal reinforcement lbs.	376,000	5,483	8,111	0.01	0.02
Steel castings lbs.	9,800	3,912	3,912	39.9	39.9
Iron castings, machined lbs.	7,300	6,524	6,524	89.3	89.3
Wrought iron pipe, 3-inch diameter lin. ft.	250	238	238	95.2	95.2
Wrought iron pipe railing lin. ft.	430	0	0	0	0
Metal in lock-gates lbs.	200,000	117,768	117,768	58.9	58.9
Metal in buffer-beams lbs.	92,000	66,739	69,360	72.5	75.4
Metal in lock-valves lbs.	25,000	22,087	22,087	88.3	88.3
Coffer-dams, pumping, bailing and draining lump sum	\$18,000	\$4,770	\$12,000	26½	66½

* Work on these items practically completed. Small per cent retained to cover cost of painting and repairs.

CHAMPLAIN CANAL, RESIDENCY No. 3.

Resident Engineer E. V. R. Payne reports:

Residency No. 3, Champlain canal, extends from the highway bridge at Dunham's Basin, Washington county, northerly to Lake Champlain at Whitehall, a distance of 19.8 miles.

The following contracts are located within the limits of this residency: Nos. 15 and 25 and portions of Nos. 16, 32, 33 and 90.

Mr. D. B. LaDu, Resident Engineer, was in charge until January 1, 1912, when, on his appointment as Division Engineer, this residency was combined with residency No. 2, and E. V. R. Payne, Resident Engineer, assumed charge of both residencies.

Final estimates for contracts Nos. 15, 16, 33 and 90 have been compiled and that for contract No. 25 is nearly complete. Twenty-two overflow surveys and appropriation maps were made and corners marked for lands affected by the change in Barge canal levels from Comstock to Whitehall. Considerable time was spent in reporting on the Atlantic, Gulf & Pacific Company's claims in connection with their contracts.

Contract No. 15.

This contract provides for excavating the canal and protecting its sides, constructing lock No. 11, dam No. 4, lock No. 12, dam No. 5, and appertaining structures, a spillway, a highway, two

BARGE CANAL, CONTRACT NO. 15.

Site of Barge canal lock No. 12, at Whitehall, before beginning of construction.

1504

2

3

4

5

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masonry culverts, five bridges with their piers and abutments, and other incidental details, between Lake Champlain, at Whitehall, Sta. 0-73, and Sta. 356 on Wood creek, about 0.6 mile north of Comstock post-office, Washington county. Length, 6.8 miles. W. C. Benedict, Assistant Engineer. Atlantic, Gulf & Pacific Company, contractor.

At the end of the fiscal year (1911) this contract was nearly completed, except the trimming of slopes and embankments and placing paving and the railings on the bridges at Whitehall, which was done prior to January 1, 1912.

About 31,000 cu. yds. of excavation were removed from the by-pass at lock No. 11 and in the prism one mile north of this lock by the dipper dredge *Comstock* and hydraulic dredge *Champlain*.

Some 7,250 cu. yds. of wash wall and 2,850 cu. yds. of riprap were placed in the by-pass and along the prism at lock No. 11.

The bridges and approaches at Clinton avenue, Saunders street and Boardman street, Whitehall, were paved complete.

A wooden crib in the upper approach to lock No. 12 was completed and the lock wall backfilled.

The contract was accepted by the Canal Board on February 21, 1912.

The deep clay cut, at Guard-lock hill, about one mile north of lock No. 11, continued to slide into the prism; the contractors are now flattening the east slope from a one-on-two to a one-on-four slope for a length of about 500 feet. This work is done under a special agreement with the Superintendent of Public Works and is inspected by the State Engineer's department.

The following is a summary of items on contract No. 15, as affected by alterations Nos. 1, 2, 3, 4, 5, 7, 8, 9, 10, 12, 13, 14, 15 and 16, to September 30, 1912:

ITEMS OF WORK.	Preliminary estimate, as affected by alterations.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Clearing.....acres	12.36	0	12.36	0	Contract completed.
Grubbing.....cu. yds.	12,000	0	7,803	0	
All excavation.....cu. yds.	2,921,400	81,671	2,718,464	3	
Sheeting and bracing.....ft. B. M.	50,000	435	50,280	0.9	
Embankment.....cu. yds.	167,500	6,669	102,392	6.5	
Lining.....cu. yds.	3,992	1,131	2,912	38.8	

ITEMS OF WORK.		Preliminary estimate, as affected by alterations.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Sawed lumber, hemlock	ft B. M.	40,000	6,885	33,789	20 4	Contract completed
Sawed lumber, spruce	ft B. M.	8,500	0	6,547	0	
Sawed lumber, yellow pine or Douglas fir	ft B. M.	108,500	25,820	96,160	26 3	
Sawed lumber, white oak in water-ways	ft B. M.	4,430	0	3,824	0	
Stone filling in cribs	cu. yds.	850	159	726	21 9	
Foundation piles	No.	9,188	0	7,298	0	
Fender piles	No.	30	7	28	25	
Sheet-piling	ft B. M.	100,740	550	87,962	0 6	
All classes concrete	cu. yds.	57,899	14 1	56,643 1	0 02	
Dam coping	cu. yds.	16	0 33	15 33	0 21	
Bridge coping	cu. yds.	12	2 72	9 72	28	
Dry retaining wall	cu. yds.	80	1	74	1 4	
Wash wall	cu. yds.	24,684	7,416	21,807	30 1	
Third-class stone paving	sq. yds.	2,187	1,013	1,542	65 7	
All classes riprap	cu. yds.	8,540	2,965	5,862	50 6	
4-inch vitrified pipe	lin. ft.	300	2	270	7	
Iron castings, plain	lbs.	163,893	4,224	162,589	2 6	
Iron castings, machined	lbs.	50,000	968	49,572	1 9	
Structural steel	lbs.	1,227,093	127,673	1,112,338	11 4	
Metal reinforcement	lbs.	104,550	1,157	103,102	1 1	
Portland cement sidewalk	sq. ft.	4,350	3,687	3,995	92	
Wooden block pavement	sq. yds.	760	97	750	12 9	
Wooden fencing	lin. ft.	2,590	330	2,194	15	
Ballast	cu. yds.	180	83	144	58	
Ballast	lin. ft.	650	127	633	20	
Ballast	lin. ft.	240	251	251	100	
Ballast	lbs. ft.	800	622	622	Finished	
Gate railing	lump sum	\$5,200	0	\$5,200	0	
Gate lock No. 11	lump sum	\$2,400	0	\$2,400	0	
Gate lock No. 12	lump sum	\$3,100	0	\$3,100	0	
Gate lock No. 12	lump sum	\$700	0	\$700	0	
Gate lock No. 12	lump sum	\$7,200	0	\$7,200	0	
Gate lock No. 3	lump sum	\$4,300	0	\$4,300	0	
Gate lock No. 11	lump sum	\$11,100	0	\$11,100	0	
Gate lock No. 11	lump sum	\$4,500	0	\$4,500	0	
Gate lock No. 12	lump sum	\$9,900	0	\$9,900	0	
Sawed lumber, red oak	ft B. M.	25,400	7,386	24,396	30 3	
Stone curbs	lin. ft.	690	690	690	100	
Deduct for buildings not removed	lump sum	\$100	\$100	\$100		
Total			\$41,896	\$1,378,956 17		

Contract No. 16 (on Contract No. 25).

This contract provides for furnishing and erecting in place steel highway bridges. A. R. Morse, Assistant Engineer. The United Construction Company, contractor.

The bridges at Comstock, Dewey's, Fort Ann, Brayton's, Smiths Basin and Geo. Henry's were erected complete, together with the railings on approaches, between December, 1911, and July, 1912, and traffic turned over them.

Lock No. 12, at Whitehall, which is completed and equipped with electric power plant and operating machinery and has been in full operation during the season of 1912.

BARGE CANAL, CONTRACT NO. 15.

Contract No. 25.

This contract provides for excavating the canal and protecting its sides, constructing lock No. 9 and necessary spillways, power plants and appertaining structures, bridge substructures and approaches, retaining walls, highways, and other incidental details between Sta. 356, about 0.6 mile north of Comstock post-office, and Sta. 1041+54, at Dunhams Basin road, Washington county. Length of contract, 13 miles. W. B. Watson, Assistant Engineer. Atlantic, Gulf & Pacific Company, contractor.

In the earth sections, for the entire length of the contract, the hydraulic dredge *Champlain* and two sloping machines continued work during the year, except in the winter.

At the rock cuts two dipper dredges, a Bishop excavator and two orange peel buckets (mounted on scows) operated continuously, except in the winter months, during which time a small amount of rock was removed by hand. Practically all excavation remaining to be done is in these rock cuts — high, scattered points. Two small rock cuts between Smiths Basin and Dunhams Basin were completed by hand during the winter.

All bridge substructures are completed, with the exception of a small amount of lining and riprap at Henry's bridge and the east abutment at Comstock.

Northwest approach wall to lock No. 9 and isolated snubbing posts are finished.

The baffle dam in the ditch connecting the Smiths Basin spillway from the old canal with the Barge canal has been completed.

Piling and riprap for the railroad bank protection, north of Fort Ann, are finished.

A small amount of wash wall at the south end of the contract and repairs to several slides will complete the wash wall on the entire contract.

The highway work, except a small piece of road south of Comstock, is complete.

The general work yet to be done is the removal of plant and a small amount of rubbish, the building of small ditches to drain spoil banks, and leveling.

The following is a summary of items on contract No. 25, as affected by alterations Nos. 1, 2, 3, 4, 5, 7, 8, 9 and 10, to September 30, 1912:

ITEMS OF WORK.	Preliminary estimate, as affected by alterations.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Clearing acres	65 61	0	65 61	0	100
Grubbing cu. yds.	36,611	0	9,435	0	Finished
All excavation cu. yds.	5,621,311	211,731	5,047,518	4	98
Embankment cu. yds.	156,745	19,511	111,071	12	71
Lining cu. yds.	14,563	3,155	11,871	21	81
Sheeting and bracing ft. B. M.	104,701	43,083	61,857	41	59
Sawed lumber, hemlock ft. B. M.	2,800	0	2,570	0	Finished
Sawed lumber, yellow pine or Douglas fir ft. B. M.	151,888	3,120	145,943	2	Finished
White oak in miter-sills ft. B. M.	1,700	0	1,586	0	Finished
Piling No.	2,766	285	2,756	10	Finished
Sheet-piling ft. B. M.	1,249,088	0	1,022,066	0	Finished
Stone-coping, first-class cu. yds.	15	0	10	0	Finished
Concrete, all classes cu. yds.	27,844	1,361	26,934	5	96
Wash wall cu. yds.	53,515	21,706	51,812	41	97
Riprap, all classes cu. yds.	6,215	1,486	3,812	24	61
Paving, second-class sq. yds.	3,097	1,817	1,832	57	Finished
Ballast cu. yds.	313	49	134	14	Finished
Iron castings, plain lbs.	25,951	2,331	25,262	9	Finished
Iron castings, machined lbs.	20,000	0	19,008	0	Finished
Metal reinforcement lbs.	68,345	21,101	66,571	31	Finished
Structural steel lbs.	58,788	179	33,438	1	Finished
Wrought iron pipe railing lin. ft.	310	243	243	78	Finished
Wooden fence lin. ft.	5,640	3,415	3,415	61	69
Removing superstructures lump sum	\$600	\$600	\$600	100	100
Fender fastenings lbs.	243	11	274	4	Finished
Dry rubble masonry cu. yds.	3,010	0	298	0	Finished
Moving temporary bridge lump sum	\$800	0	\$800	0	100
Cinder filling cu. yds.	2,020	1,661	1,661	82	Finished
Dressing face of walls, old lock No. 18, lump sum	\$350	0	\$350	0	100
Gross estimate	\$1,707,191	\$115,272	\$1,525,567	7	90

Contract No. 33 (on Contract No. 15).

This contract provides for erecting movable dam machinery for dam No. 5, contract No. 15, Champlain canal. A. R. Morse, Assistant Engineer. Penn Bridge Company, contractor.

The erection of the movable dam machinery for dam No. 5, at Whitehall, was finished in November, 1911, and it was operated during the winter of 1911-1912, and contract was accepted.

Contract No. 90.

This contract provides for furnishing and installing equipment for operating and lighting locks Nos. 9, 11 and 12 on the Champlain canal. A. R. Morse, Assistant Engineer. D'Olier Engineering Company, contractor.

Lock No. 9. The power-house, turbines, generators, switch-board, gate and valve-operating machinery, light poles and all connections were placed and connected up, after which the fixtures on the light poles were removed and stored in the power house, as this plant will not be used this season.

Lock No. 11. With the finishing of the interior of the building, the work is complete. Turbines, generators, switch-board, gate and valve-operating machinery and accessories, control cabinets, panel boards, light poles and connecting lines have been connected up and operated successfully during the season of 1912.

Lock No. 12. The power-house was finished, and turbines, generators and switchboard connected up, and cabinets, panels and gate-operating machinery installed and operated successfully during the present year.

The contract has been accepted.

VOL. I—5

THE FOLLOWING STATEMENTS SHOW THE NAMES, RANK AND COMPENSATION OF ENGINEERS EMPLOYED IN THE EASTERN DIVISION OF THE DEPARTMENT OF THE STATE ENGINEER AND SURVEYOR, TOGETHER WITH INCIDENTAL EXPENSES, FOR THE FISCAL YEAR ENDED SEPTEMBER 30, 1912.

Ordinary Repairs to Canals — Erie Canal.

Chapter 810, Laws of 1911.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
D. B. La Du	Division engineer	\$350 per month	\$2,450 00 .....	.....	\$2,450 00
J. A. O'Connor	Division engineer	350 per month	1,050 00 .....	.....	1,050 00
J. B. Maguire	Assistant engineer	6 00 per day	30 00 .....	.....	30 00
Hugh Reilly	Cashier	150 per month	565 00 .....	.....	565 00
Hattie A. Dell	Stenographer	100 per month	200 00 .....	.....	200 00
Frank Roberts	Rodman	4 00 per day	208 00 .....	.....	208 00
			\$4,503 00		\$4,503 00
<i>Incidental Expenses.</i>					
Fuel and light				\$110 20	
Stationery and printing				21 21	
Postage				160 29	
Telephone and telegraph				2,188 39	
Miscellaneous				306 72	
					2,786 81
Total					\$7,289 81

Ordinary Repairs to Canals — Champlain Canal.

Chapter 810, Laws of 1911.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
D. B. La Du	Division engineer	\$350 per month	\$350 00 .....	.....	\$350 00
G. M. Rodger	Leveler	4 50 per day	40 50	\$17 60	58 10
Wayland Dickens	Leveler	4 50 per day	49 50 .....	.....	49 50
Harvey Malcolm	Chainman	2 50 per day	29 50 .....	.....	29 50
Wm. Leffler	Laborer	2 00 per day	22 00 .....	.....	22 00
W. L. Collins	Stenographer	60 per month	38 71	5 79	44 50
Hattie A. Dell	Stenographer	100 per month	800 00 .....	.....	800 00
Hugh Reilly	Cashier	150 per month	1,200 00 .....	.....	1,200 00
Frank Roberts	Rodman	4 00 per day	104 00 .....	.....	104 00
			\$2,634 21	\$23 39	\$2,657 60
<i>Incidental Expenses.</i>					
Fuel and light				\$162 40	
Stationery and printing				59 30	
Postage				126 00	
Telephone and telegraph				1,080 51	
Miscellaneous				324 38	
					2,052 59
Total					\$4,710 19

Construction of Barge Canal—Head Office Account.

Chapter 147, Laws of 1903, and amendatory laws.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
Alex. E. Kastl.....	Special deputy state engineer....	\$500 per month	\$6,000 00	\$608 60	\$6,608 60
H. D. Alexander.....	Special resident engineer.....	333 33 per month	3,999 96	150 41	4,150 37
J. A. O'Connor.....	Division engineer.....	350 per month	.....	42 75	42 75
R. S. Greeman.....	Resident engineer.....	250 per month	3,000 00	2,939 32	5,939 32
C. H. MacCulloch.....	Resident engineer.....	225 per month	2,700 00	4 95	2,704 95
H. D. Miller.....	Resident engineer.....	250 per month	2,775 00	.....	2,775 00
Noble E. Whitford.....	Resident engineer.....	250 per month	2,982 76	37 78	3,020 54
W. G. Wildes.....	Resident engineer.....	225 per month	2,068 06	239 89	2,307 95
M. G. Barnes.....	Consulting engineer.....	60 00 per day, when employed...	5,760 00	485 58	6,245 58
Wm. H. Burr.....	Consulting engineer.....	60 00 per day, when employed...	3,360 00	448 38	3,808 38
G. S. Greene, Jr.....	Consulting engineer.....	60 00 per day, when employed...	3,900 00	503 12	4,403 12
Joseph Ripley.....	Consulting engineer.....	600 per month	6,906 95	532 71	7,439 66
T. Kennard Thomson.....	Consulting engineer.....	60 00 per day, when employed...	4,020 00	501 52	4,521 52
A. W. Conner.....	Civil engineer of grade crossings.....	176 per month	1,998 58	7 30	2,005 88
C. C. Egbert.....	Expert on electrical design.....	20 00 per day	1,330 00	15 15	1,345 15
G. F. Stickney.....	Expert lock designer and super- vising engineer.....	416 66 per month	3,333 25	186 22	3,519 47
W. H. Yates.....	Supervising engineer.....	333 33 per month	2,722 20	499 86	3,222 06
T. L. McBean.....	Special expert draftsman.....	20 00 per day	100 00	24 50	124 50
W. R. Davis.....	Chief bridge designer.....	375 per month	3,449 43	61 40	3,510 83
Henry Auerbach.....	Bridge designer.....	150 per month	382 25	.....	382 25
J. L. Bradford.....	Bridge designer.....	175 per month	565 83	.....	565 83
H. E. Brainard.....	Bridge designer.....	175 per month	875 00	160 56	1,035 56
E. A. Brainerd.....	Bridge designer.....	175 per month	1,925 00	.....	1,925 00
Horace Corbin.....	Bridge designer.....	150 per month	245 00	.....	245 00
J. C. Green.....	Bridge designer.....	175 per month	2,100 00	.....	2,100 00
C. N. Haggart.....	Bridge designer.....	175 per month	1,337 90	.....	1,337 90
A. G. Hayden.....	Bridge designer.....	175 per month	2,013 06	.....	2,013 06
F. A. Hermans.....	Bridge designer.....	150 per month	1,056 89	.....	1,056 89
Harold Levy.....	Bridge designer.....	175 per month	1,195 08	.....	1,195 08
W. S. McDowell.....	Bridge designer.....	150 per month	411 29	.....	411 29
E. L. Pierce.....	Bridge designer.....	150 per month	1,220 00	.....	1,220 00
J. C. Podmore.....	Bridge designer.....	175 per month	1,318 33	.....	1,318 33
J. M. C. Quarles de Quarles.....	Bridge designer.....	175 per month	2,075 00	.....	2,075 00
H. J. Scheuermann.....	Bridge designer.....	175 per month	1,050 00	.....	1,050 00
E. G. Semon.....	Bridge designer.....	150 per month	1,555 65	.....	1,555 65
J. E. Tonnelier.....	Bridge designer.....	150 per month	1,800 00	.....	1,800 00
L. C. West.....	Bridge designer.....	150 per month	1,530 00	.....	1,530 00
C. H. Wood.....	Bridge designer.....	175 per month	2,100 00	.....	2,100 00
I. S. Abrahams.....	Bridge draftsman.....	125 per month	987 50	.....	987 50
J. M. Angus.....	Bridge draftsman.....	125 per month	1,500 00	.....	1,500 00
J. F. Blaise.....	Bridge draftsman.....	125 per month	1,140 00	.....	1,140 00
S. Cohen.....	Bridge draftsman.....	125 per month	914 77	3 81	918 58
L. H. Friedman.....	Bridge draftsman.....	125 per month	433 47	10 64	444 11
C. E. Quimby.....	Bridge draftsman.....	125 per month	1,190 00	.....	1,190 00
W. M. Smelo.....	Bridge draftsman.....	125 per month	302 41	.....	302 41
A. C. Miller.....	Bridge draftsman.....	100 per month	563 78	.....	563 78
A. Bluestone.....	Junior bridge draftsman.....	75 per month	200 00	.....	200 00
E. E. Briggs.....	Junior bridge draftsman.....	100 per month	1,200 00	1 95	1,204 95
A. E. Green.....	Junior bridge draftsman.....	75 per month	195 96	.....	195 96
C. A. Huhne.....	Junior bridge draftsman.....	75 per month	105 32	.....	105 32
Israel Orlian.....	Junior bridge draftsman.....	75 per month	198 38	.....	198 38
A. G. Chapman.....	Chief clerk.....	3,600 per year	.....	29 23	29 23
F. R. Clair.....	Auditor and financial clerk.....	250 per month	3,000 00	591 41	3,591 41
Thomas Hassett.....	Confidential assistant.....	333 33 per month	3,999 96	820 22	4,820 18
J. H. McElroy.....	Chief clerk.....	225 per month	1,380 00	89 89	1,469 89
R. V. Somerville.....	Confidential clerk and steno- rapher.....	175 per month	2,100 00	674 00	2,774 00
J. M. Smelzer.....	Index clerk.....	150 per month	1,770 00	.....	1,770 00
C. B. Dunham, Jr.....	Clerk.....	150 per month	1,725 00	21 21	1,746 21
J. T. Gorman.....	Clerk.....	125 per month	1,437 50	97 69	1,535 19
J. C. Guffin.....	Clerk.....	125 per month	1,437 50	.....	1,437 50
J. E. F. Minnock.....	Clerk.....	125 per month	1,475 00	.....	1,475 00
G. T. Waterman.....	Clerk.....	100 per month	1,080 00	.....	1,080 00
Nelle Clark.....	Stenographer.....	100 per month	1,200 00	.....	1,200 00
W. L. Collins.....	Stenographer.....	100 per month	670 00	.....	670 00
F. A. Dempsey.....	Stenographer.....	75 per month	83 47	.....	83 47

Construction of Barge Canal — Head Office Account — (Continued).

Chapter 147, Laws of 1903, and amendatory laws.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
Agnes Fogarty	Stenographer	\$50 per month	\$454 66		\$454 66
Adele Hallenbeck	Stenographer	100 per month	1,066 64		1,066 64
Grace Haswell	Stenographer	100 per month	1,066 64		1,066 64
Bertha E. Kirchner	Stenographer	100 per month	1,075 00		1,075 00
S. C. MacNeil	Stenographer	100 per month	1,200 00		1,200 00
J. J. Tobin	Stenographer	125 per month	1,450 00	\$4 07	1,454 07
Cleora Van Vleck	Stenographer	100 per month	1,200 00		1,200 00
Mabel Wienbols	Stenographer	100 per month	1,300 00		1,300 00
Anna M. Weber	Stenographer	75 per month	810 00		810 00
R. B. Allen	Engineering draftsman	4 00 per day	906 00		906 00
C. M. Chuckrow	Engineering draftsman	4 00 per day	537 00	5 31	542 31
J. H. McCormick, Jr.	Engineering draftsman	5 00 per day	1,490 00	8 82	1,498 82
G. D. Meer	Engineering draftsman	5 00 per day	1,555 00	20 84	1,575 84
Chas. Messina	Engineering draftsman	4 00 per day	873 00		873 00
W. J. Picard	Engineering draftsman	5 00 per day	1,565 00		1,565 00
G. L. Schillner	Engineering draftsman	5 00 per day	1,400 00		1,400 00
J. H. Stevens	Engineering draftsman	5 00 per day	1,505 00		1,505 00
S. T. Vosburg	Engineering draftsman	5 00 per day	1,383 00		1,383 00
L. B. Westfall	Engineering draftsman	5 00 per day	1,505 00	3 86	1,508 86
J. J. Cosgrave	Architectural draftsman	150 per month	1,700 00		1,700 00
F. E. Blake	Mechanical engineer and draftsman	200 per month	2,250 00	4 95	2,254 95
J. A. Jensen	Mechanical draftsman	125 per month	234 56		234 56
W. S. Klos	Mechanical draftsman	125 per month	750 00		750 00
C. P. Wiweke	Mechanical draftsman	125 per month	1,475 00		1,475 00
T. L. Ainsworth	Tracer	83 33 per month	783 33		783 33
Leroy Bamer	Tracer	83 33 per month	908 33		908 33
J. H. Forth	Tracer	83 33 per month	908 33		908 33
Bernard Gasier	Tracer	83 33 per month	908 33		908 33
C. J. Hall	Tracer	60 00 per month	26 00		26 00
W. J. Henk	Tracer	83 33 per month	533 33		533 33
C. T. Kniskern, Jr.	Tracer	83 33 per month	908 33	11 40	919 73
P. R. Murray	Tracer	83 33 per month	908 33		908 33
H. F. Reed	Tracer	60 00 per month	410 00		410 00
Reuben Rudermann	Tracer	60 00 per month	16 00		16 00
R. N. Barrett	Assistant engineer	5 00 per day	1,510 00		1,510 00
H. W. Benedict	Assistant engineer	6 00 per day	1,884 00		1,884 00
W. C. Bratton	Assistant engineer	5 00 per day	545 00		545 00
Clark Brown	Assistant engineer	7 00 per day	2,009 00		2,009 00
A. T. Clark	Assistant engineer	6 00 per day	1,352 00		1,352 00
D. H. Daley	Assistant engineer	7 00 per day	2,015 00	15 30	2,030 30
F. M. Eames	Assistant engineer	7 00 per day	2,009 00		2,009 00
H. A. Gehring	Assistant engineer	6 00 per day	468 00	7 77	475 77
Ely Gamse	Assistant engineer	5 00 per day	175 00	7 96	182 96
M. W. Grimes	Assistant engineer	6 00 per day	1,624 00		1,624 00
F. B. Hall	Assistant engineer	5 00 per day	990 00	4 94	994 94
C. L. Hayward	Assistant engineer	6 00 per day	1,112 00	6 08	1,118 08
T. R. Hazelum	Assistant engineer	5 00 per day	330 00		330 00
R. L. Holt	Assistant engineer	6 00 per day	1,878 00		1,878 00
E. C. Lawton	Assistant engineer	6 00 per day	264 00		264 00
D. R. Lee	Assistant engineer	7 00 per day	1,909 00		1,909 00
O. F. Lewis	Assistant engineer	6 00 per day	1,638 00		1,638 00
J. B. Maguire	Assistant engineer	6 00 per day	360 00		360 00
I. S. Matlaw	Assistant engineer	7 00 per day	1,904 00		1,904 00
C. W. Morris, Jr.	Assistant engineer	6 00 per day	1,884 00	1 00	1,885 00
E. P. Neuschwander	Assistant engineer	6 00 per day	1,884 00		1,884 00
J. P. Newton	Assistant engineer	7 00 per day	2,009 00	794 13	2,803 13
J. A. O'Donnell	Assistant engineer	5 00 per day	1,565 00		1,565 00
R. E. Phillips	Assistant engineer	7 00 per day	2,172 50	332 78	2,505 28
E. G. Raynor	Assistant engineer	7 00 per day	1,912 00		1,912 00
D. B. Sayer	Assistant engineer	5 00 per day	395 00		395 00
W. H. Slingerland	Assistant engineer	7 00 per day	2,009 00		2,009 00
Rupert Sturtevant	Assistant engineer	7 00 per day	1,982 00	55 26	2,037 26
S. R. Tighe	Assistant engineer	5 00 per day	975 00		975 00
G. G. Underhill	Assistant engineer	6 00 per day	942 00	159 55	1,101 55
T. L. Watkins	Assistant engineer	6 00 per day	1,742 00	16 65	1,758 65
H. A. Weeks	Assistant engineer	7 00 per day	1,964 00	4 01	1,968 01
W. E. Weller	Assistant engineer	5 00 per day	505 00		505 00
W. J. Weigmann	Assistant engineer	6 00 per day	234 00	14 07	248 07
J. B. Whipple	Assistant engineer	6 00 per day	1,037 00		1,037 00
H. T. Arnold	Leveler	5 00 per day	975 00	15 96	990 96
Jacob Bendel	Leveler	4 50 per day	594 00	6 58	600 58

Construction of Barge Canal—Head Office Account—(Continued).

Chapter 147, Laws of 1903, and amendatory laws.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
N. E. Cottrell	Leveler	\$5 00 per day	\$1,552 00		\$1,552 00
Wayland Dickens	Leveler	4 50 per day	825 50		825 50
F. J. Doerhoefer	Leveler	4 50 per day	94 50	\$4 70	99 20
T. J. Loonie	Leveler	5 00 per day	1,056 50		1,056 50
J. T. Murphy	Leveler	4 50 per day	1,351 00		1,351 00
E. S. Overbaugh	Leveler	4 50 per day	549 00		549 00
J. M. Prior	Leveler	5 00 per day	855 00		855 00
J. A. Pritchard	Leveler	5 00 per day	1,423 66	7 92	1,431 58
G. G. Sweet	Leveler	5 00 per day	1,565 00		1,565 00
J. A. Wallace	Leveler	5 00 per day	252 00	4 85	256 85
M. H. Boigeol	Rodman	4 00 per day	531 00		531 00
J. S. Burns	Rodman	3 50 per day	1,003 50		1,003 50
G. B. Kelley	Rodman	4 00 per day	1,174 00		1,174 00
E. H. Leggett	Rodman	3 50 per day	248 50		248 50
H. J. O'Hara	Rodman	3 50 per day	70 00		70 00
N. B. Robbins	Rodman	3 50 per day	1,012 50		1,012 50
Raymond Shelley	Rodman	4 00 per day	1,252 00		1,252 00
L. F. Walsh	Rodman	3 50 per day	52 50		52 50
Harry Blum	Chainman	2 50 per day	75 00		75 00
E. J. Bullis	Chainman	2 50 per day	117 50		117 50
Harvey Malcolm	Chainman	2 50 per day	410 00		410 00
B. Z. Wildenberg	Chainman	3 00 per day	611 00	39 20	650 20
E. V. Allendorph	Inspector of masonry	5 00 per day	980 00		980 00
M. S. Bierce	Inspector of masonry	5 00 per day	1,565 00		1,565 00
J. M. Taylor	Inspector of masonry	5 00 per day	1,552 00	22 44	1,574 44
C. G. Hadley	Electrical inspector	150 per month	1,800 00	522 21	2,322 21
Wm. J. Atkinson	Laborer	2 00 per day	712 00		712 00
D. F. Allen	Laborer	2 00 per day	634 00		634 00
L. R. Baldwin	Laborer	2 00 per day	704 00		704 00
J. J. Barrett	Laborer	2 00 per day	374 00		374 00
J. H. Boyland	Laborer	2 00 per day	524 00		524 00
M. E. Brainerd	Laborer	2 00 per day	626 00		626 00
T. M. Brennock	Laborer	2 00 per day	252 00		252 00
J. H. Byrnes	Laborer	2 00 per day	362 00		362 00
W. B. Chapman	Laborer	2 00 per day	52 00		52 00
Wm. C. Clark	Laborer	2 00 per day	316 00		316 00
J. E. Collins	Laborer	2 00 per day	396 00		396 00
J. M. Connolly	Laborer	2 00 per day	312 00		312 00
Jas. L. Daley	Laborer	2 00 per day	548 00		548 00
Patrick Degan	Laborer	2 00 per day	632 00		632 00
Michael Dolan	Laborer	2 00 per day	630 00		630 00
Wm. Doyle	Laborer	2 00 per day	102 00		102 00
J. J. Duffy	Laborer	2 00 per day	158 00		158 00
W. H. Dugan	Laborer	2 00 per day	278 00		278 00
Peter Farnan	Laborer	2 00 per day	630 00		630 00
J. E. Farley	Laborer	2 00 per day	632 00		632 00
S. A. Feehan	Laborer	2 00 per day	652 00		652 00
J. M. Fogarty	Laborer	2 00 per day	590 00		590 00
P. J. Gaffney	Laborer	2 00 per day	208 00		208 00
S. Habbinger	Laborer	2 00 per day	24 00		24 00
Arnold Hooper	Laborer	2 00 per day	104 00		104 00
O. A. Jacobs	Laborer	2 00 per day	366 00		366 00
W. T. Lansing	Laborer	2 00 per day	494 00		494 00
Wm. Leffler	Laborer	2 00 per day	116 00		116 00
Myer Livingston	Laborer	2 00 per day	626 00		626 00
S. Lodewick	Laborer	2 00 per day	680 00		680 00
J. M. Macdonald	Laborer	2 00 per day	626 00		626 00
A. McDougall	Laborer	2 00 per day	260 00		260 00
F. W. McEnaney	Laborer	2 00 per day	628 00		628 00
Henry Mac Farlane	Laborer	2 00 per day	610 00		610 00
P. J. McGoldrick	Laborer	2 00 per day	626 00		626 00
J. C. McShane	Laborer	2 00 per day	574 00		574 00
Leopold Miller	Laborer	2 00 per day	626 00		626 00
Jos. Murray	Laborer	2 00 per day	352 00		352 00
Leonard Paige	Laborer	2 00 per day	184 00	123 11	307 11
Amos Prescott	Laborer	2 00 per day	146 00		146 00
Thos. Rattoone	Laborer	2 00 per day	632 00		632 00
J. J. Roach	Laborer	2 00 per day	262 00		262 00
P. J. Ryan	Laborer	2 00 per day	623 00		623 00
P. F. Sculley	Laborer	2 00 per day	162 00		162 00
W. J. Smith	Laborer	2 00 per day	674 00		674 00
H. J. Soules	Laborer	2 00 per day	626 00		626 00

Construction of Barge Canal — Head Office Account — (Concluded).

Chapter 147, Laws of 1903, and amendatory laws.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
H. A. Sweeney	Laborer	\$2 00 per day	\$626 00		\$626 00
Cuyler Ten Eyck	Laborer	2 00 per day	630 00		630 00
M. A. Tierney	Laborer	2 00 per day	242 00		242 00
Michael Tierney	Laborer	2 00 per day	626 00		626 00
V. R. Tremper	Laborer	2 00 per day	88 00		88 00
A. F. Wilson	Laborer	2 00 per day	358 00		358 00
M. E. Baker	Axeman and office assistant	2 50 per day	860 00		860 00
P. F. Burmaster	Axeman and office assistant	2 50 per day	782 50		782 50
J. F. Duffy	Axeman and office assistant	2 50 per day	496 00		496 00
G. B. Fitzgerald	Axeman and office assistant	2 50 per day	485 00		485 00
W. T. Fonda	Axeman and office assistant	2 50 per day	132 50		132 50
Edgar Hull	Axeman and office assistant	2 50 per day	802 50		802 50
Robert Maloy	Axeman and office assistant	2 50 per day	423 00		423 00
J. J. Murnane	Axeman and office assistant	2 50 per day	787 50		787 50
P. D. Unger	Axeman and office assistant	2 50 per day	785 00		785 00
F. C. Batt	Chauffeur	125 per month	879 17	\$232 50	1,111 67
F. E. Davis	Chauffeur	100 per month	343 33	24 82	408 15
J. J. Finn	Chauffeur	100 per month	247 10	81 05	368 15
H. W. Nutter	Chauffeur	100 per month	850 00	173 87	1,023 87
F. M. Hill	Title maker	120 per month	1,440 00		1,440 00
E. M. Chamberlain	Night watchman	80 per month	960 00		960 00
Sibella Carroll	Charwoman	1 25 per day	391 25		391 25
J. J. McManus	Foreman of borings	4 50 per day	1,323 00		1,323 00
E. H. Wetzel	Foreman of public works	5 00 per day	575 00		575 00
			\$256 812 31	\$12,531 01	\$269,343 32
<i>Incidental Expenses.</i>					
Instruments, tools and appliances				\$200 68	
Office rent				4,423 08	
Fuel and light				199 80	
Stationery and printing				6,645 78	
Postage				1,258 20	
Telephone and telegraph				2,347 75	
Miscellaneous				21,804 11	
					36,879 40
Total					\$306,222 72

Construction of Barge Canal — Erie Canal.

Chapter 147, Laws of 1903, and amendatory laws.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
D. B. LaDu	Division engineer	\$350 per month	\$175 00	\$426 31	\$601 31
J. A. O'Connor	Division engineer	350 per month		219 48	219 48
S. W. Belding	Resident engineer	250 per month	2,225 80	112 67	2,338 47
P. H. Dater	Resident engineer	250 per month	3,000 00	363 58	3,363 58
Carleton Greene	Resident engineer	250 per month	750 00	117 22	867 22
E. D. Hendricks	Resident engineer	225 per month	2,600 00	331 76	2,931 76
E. A. Lamb	Resident engineer	250 per month	2,900 00	321 82	3,221 82
G. I. Oakley	Resident engineer	225 per month	2,067 00	1,023 74	3,090 74
H. O. Schermerhorn	Resident engineer	225 per month	900 00	37 00	937 00
G. W. Stickney	Resident engineer	250 per month	2,176 00	144 00	2,320 00
Earle Talbot	Resident engineer	250 per month	1,500 00	320 95	1,820 95
H. E. Brainard	Bridge designer	175 per month	775 83	101 83	877 71
P. D. Wendell	Estimate clerk	250 per month	1,325 00	43 19	1,368 19
Hattie A. Dell	Stenographer	100 per month	200 00		200 00
R. S. Foster	Stenographer	75 per month	525 00		525 00
P. J. Gaffey	Stenographer	75 per month	845 00		845 00
Jane Kerns	Stenographer	2 50 per day	242 50		242 50
J. A. Murray	Stenographer	83 33 per month	439 98		499 98
James J. Neville	Confidential stenographer to division engineer	125 per month	1,370 83	611 79	1,982 62

Construction of Barge Canal — Erie Canal — (Continued).

Chapter 147, Laws of 1903, and amendatory laws.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
Georgina Pfau	Stenographer	\$75 per month	\$900 00		\$900 00
J. L. Richards	Stenographer	75 per month	450 00	\$2 34	482 34
H. L. Clarke	Engineering draftsman	5 00 per day	185 00		185 00
J. A. Galvin	Engineering draftsman	5 00 per day	1,630 00		1,630 00
F. E. Gillen	Engineering draftsman	4 00 per day	1,264 00		1,264 00
E. C. Hackett	Engineering draftsman	5 00 per day	1,645 00	2 00	1,647 00
E. L. Keeler	Engineering draftsman	5 00 per day	1,595 00		1,595 00
A. G. Austin	Assistant engineer	6 00 per day	2,094 00	341 13	2,435 13
T. S. Bailey	Assistant engineer	5 00 per day	1,610 00	41 17	1,651 17
Lewis Bartlett	Assistant engineer	6 00 per day	2,076 00	310 72	2,386 72
E. J. Becker	Assistant engineer	6 00 per day	942 00	80 04	1,022 04
J. C. Bell	Assistant engineer	6 00 per day	2,022 00	576 60	2,598 60
C. R. De Graff	Assistant engineer	5 00 per day	1,695 00	33 12	1,728 12
R. G. Finch	Assistant engineer	7 00 per day	1,472 00	124 16	1,596 16
F. W. Harris	Assistant engineer	6 00 per day	1,753 00	293 65	2,046 65
Edwin Hilborn	Assistant engineer	6 00 per day	30 00	26 94	56 94
M. E. James	Assistant engineer	6 00 per day	2,058 00	912 94	2,970 94
E. E. Kendall	Assistant engineer	6 00 per day	1,932 00	245 74	2,177 74
Chas. Kiehm	Assistant engineer	6 00 per day	48 00		48 00
H. C. Kline	Assistant engineer	6 00 per day	2,028 00	228 46	2,256 46
C. A. Lansing	Assistant engineer	5 00 per day	1,595 00		1,595 00
D. W. Overocker	Assistant engineer	6 00 per day	876 00		876 00
C. G. Ranney	Assistant engineer	6 00 per day	1,861 00		1,861 00
S. M. Stuart	Assistant engineer	5 00 per day	450 00		450 00
W. J. Weigmann	Assistant engineer	6 00 per day	1,782 00	454 21	2,236 21
M. W. Williams	Assistant engineer	6 00 per day	1,974 00	449 50	2,423 50
W. R. Abbott	Leveler	5 00 per day	1,706 00		1,706 00
S. R. Bellows	Leveler	5 00 per day	465 00	322 00	787 00
Harold Bills	Leveler	5 00 per day	1,600 00		1,600 00
W. W. Brown	Leveler	5 00 per day	1,620 00		1,620 00
C. L. Hayward	Leveler	5 00 per day	405 00		405 00
E. Hulsapple	Leveler	5 00 per day	1,535 00		1,535 00
Grant Huntley	Leveler	5 00 per day	1,630 00	20 40	1,700 40
A. D. Hyman	Leveler	5 00 per day	1,057 00		1,057 00
G. C. Ingersoll	Leveler	5 00 per day	995 00		995 00
H. W. Jewell	Leveler	5 00 per day	1,444 50		1,444 50
G. H. Jones	Leveler	5 00 per day	1,571 00		1,571 00
T. J. Loonie	Leveler	4 50 per day	409 50		409 50
A. T. Madison	Leveler	5 00 per day	1,590 00		1,590 00
Chester Moore	Leveler	5 00 per day	1,491 50		1,491 50
W. N. Niles	Leveler	4 50 per day	1,525 50		1,525 50
H. P. O'Bryan	Leveler	5 00 per day	1,075 50	8 97	1,084 47
Mott Palmer	Leveler	5 00 per day	185 00		185 00
S. M. Poutier	Leveler	4 50 per day	1,134 00		1,134 00
C. E. Smith	Leveler	5 00 per day	1,578 00		1,578 00
C. V. Smith	Leveler	4 50 per day	1,516 50		1,516 50
R. B. Smith	Leveler	5 00 per day	1,615 00		1,615 00
L. H. M. Whitney	Leveler	5 00 per day	1,745 00	161 58	1,906 58
B. Wich	Leveler	5 00 per day	630 00		630 00
J. D. Williams	Leveler	5 00 per day	1,740 00	140 43	1,880 43
C. G. Atkin	Rodman	4 00 per day	1,301 50		1,301 50
R. G. Baker	Rodman	4 00 per day	1,228 50		1,228 50
L. J. Bradley	Rodman	3 50 per day	105 00		105 00
C. E. Burleigh	Rodman	4 00 per day	1,115 50		1,115 50
J. P. Byrne	Rodman	3 50 per day	525 00	8 15	533 15
H. V. G. Du Mont	Rodman	3 50 per day	17 50		17 50
N. B. Epstein	Rodman	4 00 per day	1,051 50		1,051 50
E. W. Goff	Rodman	4 00 per day	1,332 00		1,332 00
P. Greenbaum	Rodman	3 50 per day	698 00		698 00
Jos. Helfand	Rodman	3 50 per day	1,044 50		1,044 50
J. L. Herber	Rodman	3 50 per day	237 00		237 00
A. O. Hollenbeck	Rodman	4 00 per day	1,348 00	178 89	1,526 89
W. N. Langworthy	Rodman	3 50 per day	1,218 00		1,218 00
G. H. Leet	Rodman	3 50 per day	1,034 50		1,034 50
E. F. Ludden	Rodman	4 00 per day	698 50		698 50
L. Y. Meneely	Rodman	4 00 per day	988 00		988 00
A. D. Merrill	Rodman	4 00 per day	1,336 50		1,336 50
A. R. Mulligan	Rodman	4 00 per day	1,352 00		1,352 00
E. Nicholson	Rodman	3 50 per day	283 50		283 50
A. R. Patchke	Rodman	4 00 per day	992 00		992 00
W. C. R. Pyne	Rodman	4 00 per day	452 00		452 00
G. R. Rankin	Rodman	3 50 per day	1,018 50		1,018 50
H. J. Richardson	Rodman	4 00 per day	752 00	179 87	931 87

Construction of Barge Canal — Erie Canal — (Continued).

Chapter 147, Laws of 1903 and amendatory laws.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
C. P. Riley	Rodman	\$4 00 per day	\$1,254 00		\$1,254 00
F. L. Teall	Rodman	4 00 per day	1,255 00		1,255 00
J. R. Tighe	Rodman	4 00 per day	1,277 00		1,277 00
C. A. Wilbur	Rodman	4 00 per day	1,187 00		1,187 00
R. G. Williams	Rodman	4 00 per day	687 00		687 00
A. F. Bayly	Chainman	3 00 per day	990 00		990 00
F. S. Belotti	Chainman	3 00 per day	722 00		722 00
J. G. Bushnell	Chainman	3 00 per day	1,065 00		1,065 00
G. T. Byrnes	Chainman	2 50 per day	10 00		10 00
P. E. Collette	Chainman	3 00 per day	1,047 00		1,047 00
J. C. Cronin	Chainman	2 50 per day	205 00		205 00
W. A. Dawson	Chainman	3 00 per day	981 00		981 00
W. E. Dickinson	Chainman	2 50 per day	140 00		140 00
H. L. Du Bois	Chainman	2 50 per day	867 50		867 50
John Edelstein	Chainman	3 00 per day	804 50		804 50
G. P. Edwards	Chainman	3 00 per day	843 50		843 50
Elias Einhorn	Chainman	2 50 per day	17 50		17 50
F. B. Faille	Chainman	3 00 per day	984 00		984 00
J. A. Kelly	Chainman	2 50 per day	830 00		830 00
R. L. Kelly	Chainman	3 00 per day	993 00		993 00
J. P. Kivlen	Chainman	3 00 per day	366 00		366 00
W. H. Manran	Chainman	3 00 per day	949 00		949 00
J. J. MacDonald	Chainman	3 00 per day	942 00		942 00
L. A. McElveney	Chainman	3 00 per day	913 00		913 00
W. A. Rice	Chainman	2 50 per day	265 00		265 00
W. C. Ruland	Chainman	3 00 per day	878 00		878 00
Wm. Smutzler	Chainman	2 50 per day	172 50		172 50
R. W. Stewart	Chainman	3 00 per day	886 50		886 50
F. B. Stoddard	Chainman	3 00 per day	531 00		531 00
C. B. Tebo	Chainman	3 00 per day	987 00		987 00
H. J. Waldvogel	Chainman	3 00 per day	948 00		948 00
H. J. Weir	Chainman	3 00 per day	378 00		378 00
J. A. Young	Chainman	3 00 per day	951 00		951 00
W. W. Barclay	Inspector of masonry	5 00 per day	350 00		350 00
J. A. Cahalin	Inspector of masonry	5 00 per day	1,665 00		1,665 00
H. B. Finan	Inspector of masonry	5 00 per day	844 50		844 50
W. M. Griffith	Inspector of masonry	3 50 per day	1,096 50		1,096 50
W. H. H. Klinkhart	Inspector of masonry	5 00 per day	1,720 00		1,720 00
W. P. Lynch	Inspector of masonry	5 00 per day	300 00		300 00
S. Y. MacGregor	Inspector of masonry	5 00 per day	1,790 00		1,790 00
T. M. Oliver	Inspector of masonry	5 00 per day	1,720 00		1,720 00
James Sim	Inspector of masonry	5 00 per day	965 00		965 00
W. K. Smith	Inspector of masonry	3 50 per day	1,029 00		1,029 00
A. M. Wait	Inspector of public works	5 00 per day	1,730 00		1,730 00
F. W. Miller	Foreman of borings		648 00		648 00
F. H. Palmer	Foreman of borings	4 00 per day	276 00	\$34 85	310 85
H. W. Stoneburg	Foreman of borings	4 00 per day	328 00	32 71	360 71
Jas. Breslin	Movable dam tender	100 per month	523 33	7 29	530 62
H. E. Jordan	Movable dam tender	100 per month	513 33	8 98	522 31
Frank McWenle	Movable dam tender	100 per month	177 42		177 42
J. J. Murphy	Movable dam tender	100 per month	1,200 00		1,200 00
Thos. Vaughn	Movable dam tender	100 per month	477 42	7 18	484 60
Edw. Baylis	Laborer	2 00 per day	458 00		458 00
Tomaso Benaquista	Laborer	2 00 per day	182 00		182 00
Frank Beetle	Laborer	2 00 per day	28 00		28 00
W. J. Biggart	Laborer	2 00 per day	646 00		646 00
F. A. Boltwood	Laborer	2 00 per day	318 00		318 00
T. M. Brennock	Laborer	2 00 per day	52 00		52 00
J. S. Butler	Laborer	2 00 per day	172 00		172 00
F. A. Button	Laborer	2 00 per day	2 00		2 00
Jos. Case	Laborer	2 00 per day	70 00		70 00
T. D. Clancy	Laborer	2 00 per day	24 00		24 00
W. C. Clark	Laborer	2 00 per day	50 00		50 00
Dominick Dagostini	Laborer	2 00 per day	74 00		74 00
Thos. Dalton	Laborer	2 00 per day	630 00		630 00
Isaac Davis	Laborer	2 00 per day	654 00		654 00
Michael Dooley	Laborer	2 00 per day	312 00		312 00
Daniel Dolan	Laborer	2 00 per day	10 00		10 00
Patrick Dorgan	Laborer	2 00 per day	294 00		294 00
F. J. Dowdell	Laborer	2 00 per day	204 00		204 00
F. Doyle	Laborer	2 00 per day	14 00		14 00
Thos. Dunn	Laborer	2 00 per day	160 00		160 00
Alphonse Fanelli	Laborer	2 00 per day	78 00		78 00

Construction of Barge Canal — Erie Canal — (Continued).

Chapter 147, Laws of 1903, and amendatory laws.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
J. A. Farrell	Laborer	\$2 00 per day	\$202 00		\$202 00
Leo Fitzgerald	Laborer	2 00 per day	210 00		210 00
J. T. Garvin	Laborer	2 00 per day	260 00		260 00
E. Glacken	Laborer	2 00 per day	154 00		154 00
Amzi Gregg	Laborer	2 00 per day	306 00		306 00
E. W. Hammond	Laborer	2 00 per day	158 00		158 00
John Hennessey	Laborer	2 00 per day	156 00		156 00
O. A. Jacobs	Laborer	2 00 per day	260 00		260 00
P. Kavanaugh	Laborer	2 00 per day	210 00		210 00
Wm. L. Kelly	Laborer	2 00 per day	96 00		96 00
Wm. Kemp, 2nd	Laborer	2 00 per day	143 00		143 00
Wm. Kneekern	Laborer	2 00 per day	292 00		292 00
Martin Kunetsky	Laborer	2 00 per day	166 00		166 00
Nathan Lasdon	Laborer	2 00 per day	104 00		104 00
John Lavery	Laborer	2 00 per day	732 00		732 00
R. Lee	Laborer	2 00 per day	31 00		31 00
Wm. Lusso	Laborer	2 00 per day	290 00		290 00
Edgar Lynd	Laborer	2 00 per day	328 00		328 00
F. T. Lyons	Laborer	2 00 per day	68 00		68 00
Philip Madden	Laborer	2 00 per day	28 00		28 00
D. F. Mahar	Laborer	2 00 per day	132 00		132 00
Daniel Malone	Laborer	2 00 per day	650 00		650 00
Dominico Mancini	Laborer	2 00 per day	42 00		42 00
Martin Manning	Laborer	2 00 per day	64 00		64 00
E. F. McCleary	Laborer	2 00 per day	382 00		382 00
Matthew McConnell	Laborer	2 00 per day	662 00		662 00
A. McDougall	Laborer	2 00 per day	364 00		364 00
John McGraw	Laborer	2 00 per day	70 00		70 00
T. McKernan	Laborer	2 00 per day	14 00		14 00
J. J. McLaughlin	Laborer	2 00 per day	190 00		190 00
Frank McMahon	Laborer	2 00 per day	22 00		22 00
Michael McMahon	Laborer	2 00 per day	468 00		468 00
J. C. McShane	Laborer	2 00 per day	52 00		52 00
Walter Merry	Laborer	2 00 per day	148 00		148 00
J. Miller	Laborer	2 00 per day	22 00		22 00
M. J. Moore	Laborer	2 00 per day	222 00		222 00
Francisco Morelli	Laborer	2 00 per day	132 00		132 00
C. A. Mower	Laborer	2 00 per day	25 00		25 00
Jacob Mower	Laborer	2 00 per day	28 00		28 00
E. J. Mullarkey	Laborer	2 00 per day	260 00		260 00
M. E. Murphy	Laborer	2 00 per day	32 00		32 00
M. J. Navin	Laborer	2 00 per day	2 00		2 00
J. J. O'Brien	Laborer	2 00 per day	56 00		56 00
M. J. O'Brien	Laborer	2 00 per day	72 00		72 00
Thos. O'Keefe	Laborer	2 00 per day	38 00		38 00
Thos. Powers	Laborer	2 00 per day	134 00		134 00
Albert Provost	Laborer	2 00 per day	26 00		26 00
J. Reardon	Laborer	2 00 per day	35 00		35 00
E. Reardon	Laborer	2 00 per day	35 00		35 00
John Riley	Laborer	2 00 per day	28 00		28 00
Wm. Riley	Laborer	2 00 per day	54 00		54 00
J. Robinson	Laborer	2 00 per day	22 00		22 00
Pasquale Salvadore	Laborer	2 00 per day	66 00		66 00
Henry Schuyler	Laborer	2 00 per day	190 00		190 00
P. V. Schuyler	Laborer	2 00 per day	228 00		228 00
Edw. Shears	Laborer	2 00 per day	112 00		112 00
F. J. Smith	Laborer	2 00 per day	2 00		2 00
J. F. Smith	Laborer	2 00 per day	142 00		142 00
Jas. Spain	Laborer	2 00 per day	418 00		418 00
C. F. Sprague	Laborer	2 00 per day	224 00		224 00
S. St. Onge	Laborer	2 00 per day	14 00		14 00
G. R. Trombley	Laborer	2 00 per day	630 00		630 00
Edw. Walsh	Laborer	2 00 per day	26 00		26 00
J. P. Walsh	Laborer	2 00 per day	304 00		304 00
S. B. Welch	Laborer	2 00 per day	632 00		632 00
Myron Wells, Jr.	Laborer	2 00 per day	694 00		694 00
R. Wemple, Jr.	Laborer	2 00 per day	306 00		306 00
P. B. White	Laborer	2 00 per day	650 00		650 00
Adolph Wilhelmy	Laborer	2 00 per day	50 00		50 00
E. B. Hollenbeck	Axeman and office assistant	2 50 per day	470 00		470 00
J. P. Hughes	Axeman and office assistant	2 50 per day	810 00		810 00
T. B. Brown	Boatman	3 00 per day	267 00		267 00

Construction of Barge Canal — Erie Canal — (Concluded).

Chapter 147, Laws of 1903, and amendatory laws

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
W. M. Cook	Boatman	\$3 00 per day	\$1,011 00		\$1,011 00
W. Davis	Boatman	3 00 per day	66 00		66 00
C. R. de Malignon	Boatman	3 00 per day	340 00		340 00
M. J. Dineen	Boatman	3 00 per day	324 00		324 00
P. J. Doorey	Boatman	3 00 per day	1,035 00		1,035 00
Wm. Duxbury	Boatman	3 00 per day	462 00		462 00
E. J. Farrell	Boatman	3 00 per day	888 00		888 00
J. J. Finn	Boatman	3 00 per day	45 00		45 00
M. F. Guerin	Boatman	3 00 per day	978 00		978 00
Jas. Holton	Boatman	3 00 per day	1,059 00		1,059 00
T. A. Keane	Boatman	3 00 per day	1,038 00		1,038 00
Stephen Lane	Boatman	3 00 per day	471 00		471 00
T. F. Madden	Boatman	3 00 per day	1,035 00		1,035 00
C. E. McCarthy	Boatman	3 00 per day	981 00		981 00
Edw. McCauley	Boatman	3 00 per day	471 00		471 00
Jas. B. McCormick	Boatman	3 00 per day	354 00		354 00
W. M. McMahon	Boatman	3 00 per day	993 00		993 00
David Morris	Boatman	3 00 per day	987 00		987 00
M. E. Mullaney	Boatman	3 00 per day	939 00		939 00
Jas. Murphy	Boatman	3 00 per day	416 00		416 00
Jos. Murray	Boatman	3 00 per day	393 00		393 00
P. J. Murray	Boatman	3 00 per day	480 00		480 00
F. L. Phalen	Boatman	3 00 per day	453 00		453 00
Peter Quinn	Boatman	3 00 per day	403 00		403 00
Frank D. Ryan	Boatman	3 00 per day	393 00		393 00
Dewitt Sparks	Boatman	3 00 per day	456 00		456 00
Glenn Storms	Boatman	3 00 per day	336 00		336 00
John Yops	Boatman	3 00 per day	450 00		450 00
Godfrey Aman	Gage reader	7 00 per month	84 00		84 00
C. V. Barrett	Gage reader	5 00 per month	60 00		60 00
John Burns	Gage reader	7 00 per month	84 00		84 00
Frank Fayant, Sr.	Gage reader	7 00 per month	84 00		84 00
John Fernald	Gage reader	5 00 per month	60 00		60 00
C. H. Fitch	Gage reader	7 00 per month	84 00		84 00
Edw. Hagerty	Gage reader	7 00 per month	84 00		84 00
C. H. Hanson	Gage reader	7 00 per month	84 00		84 00
Herbert Hockle	Gage reader	10 00 per month	120 00		120 00
Roy Hubbard	Gage reader	7 00 per month	84 00		84 00
Wm. Jones	Gage reader	7 00 per month	35 00		35 00
Lloyd Kast	Gage reader	5 00 per month	60 00		60 00
J. J. Lyons	Gage reader	5 00 per month	60 00		60 00
J. B. Mackey	Gage reader	7 00 per month	56 00		56 00
Frank McArthur	Gage reader	7 00 per month	84 00		84 00
Jas. Murphy	Gage reader	7 00 per month	84 00		84 00
P. C. Pickard	Gage reader	7 00 per month	56 00		56 00
J. Reepmeyer, Jr.	Gage reader	10 00 per month	120 00		120 00
E. P. Ryan	Gage reader	7 00 per month	77 00		77 00
A. M. Spencer	Gage reader	7 00 per month	56 00		56 00
John Stark	Gage reader	7 00 per month	56 00		56 00
W. C. Vrooman	Gage reader	7 00 per month	56 00		56 00
E. P. Walthart	Gage reader	7 00 per month	49 00		49 00
Raymond Waterbury	Gage reader	7 00 per month	21 00		21 00
Minnie E. Wheeler	Gage reader	7 00 per month	84 00		84 00
Robert Wilson	Gage reader	6 00 per month	72 00		72 00
C. W. Young	Gage reader	14 00 per month	140 00		140 00
W. E. Young	Gage reader	7 00 per month	56 00		56 00
			\$191,989 94	\$9,439 41	\$201,429 35
<i>Incidental Expenses.</i>					
Instruments, tools and appliances			\$297 75		
Office rent			1,951 25		
Fuel and light			609 47		
Stationery and printing			113 28		
Postage			197 78		
Telephone and telegraph			1,169 80		
Miscellaneous			8,334 77		
				12,674 10	
Total					\$214,103 45

Construction of Barge Canal — Champlain Canal.

Chapter 147, Laws of 1903, and amendatory laws.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
D. B. La Du	Division engineer	\$350 per month	\$925 00	\$1,000 57	\$1,925 57
J. A. O'Connor	Division engineer	350 per month		47 92	47 92
E. V. R. Payne	Resident engineer	250 per month	2,900 00	1,767 01	4,667 01
F. P. Williams	Resident engineer	250 per month	3,000 00	284 00	3,284 00
H. E. Braumard	Bridge designer	175 per month	447 78	34 16	481 94
G. W. Ruse	Clerk	150 per month	1,650 00		1,650 00
P. D. Wendell	Estimate clerk	250 per month	1,575 00	25 90	1,600 90
W. L. Collins	Stenographer	75 per month	135 00		135 00
J. J. Neville	Confidential stenographer to division engineer	125 per month	4 17	4 99	9 16
Laura I. Benjamin	Stenographer	2 50 per day	82 50		82 50
J. E. Phinney	Stenographer	100 per month	1,051 01		1,051 01
J. L. Richards	Stenographer	60 per month	240 00		240 00
H. L. Clarke	Engineering draftsman	5 00 per day	1,327 50		1,327 50
D. E. Damon	Engineering draftsman	5 00 per day	1,650 00		1,650 00
J. A. Galvin	Engineering draftsman	5 00 per	40 00	8 10	48 10
J. E. Hall	Engineering draftsman	5 00 per	1,450 00		1,450 00
F. B. Holmes	Engineering draftsman	5 00 per	400 00		400 00
I. L. Stalker	Tracer	75 per mo	375 00		375 00
S. W. Belding	Assistant engineer	6 00 per	540 00	38 61	578 61
W. C. Benedict	Assistant engineer	6 00 per	1,926 00	385 76	2,311 76
W. L. Caler	Assistant engineer	6 00 per	1,894 50		1,894 50
F. S. Crowell	Assistant engineer	6 00 per	1,092 00	82 80	1,174 80
C. A. Curtis	Assistant engineer	6 00 per	2,100 00	218 07	2,318 07
R. G. Finch	Assistant engineer	7 00 per	562 00	32 24	594 24
J. B. Foote	Assistant engineer	5 00 per	1,640 00		1,640 00
R. G. Gibson	Assistant engineer	5 00 per	1,700 00	489 70	2,189 70
H. W. Hale	Assistant engineer	6 00 per	2,082 00	242 70	2,324 70
R. D. Hayes	Assistant engineer	6 00 per	1,986 00	888 05	2,874 05
L. T. Howard	Assistant engineer	6 00 per	978 00	108 50	1,086 50
B. T. Kenyon	Assistant engineer	5 00 per	1,715 00	88 59	1,803 59
F. C. Koerner	Assistant engineer	6 00 per	90 00		90 00
J. McBride	Assistant engineer	3 00 per	1,350 00		1,350 00
A. R. Morse	Assistant engineer	5 00 per	1,575 00	341 94	1,916 94
A. C. Richards	Assistant engineer	6 00 per	648 00	16 96	664 96
B. W. Rosekrans	Assistant engineer	6 00 per	1,314 00		1,314 00
J. L. Southworth	Assistant engineer	5 00 per	1,495 00		1,495 00
W. B. Watson	Assistant engineer	6 00 per	2,094 00	959 22	3,053 22
E. W. Wendell	Assistant engineer	6 00 per	1,986 00	238 62	2,224 62
F. J. Doerhoefer	Leveler	4 50 per	432 00		432 00
F. B. Hall	Leveler	6 00 per	571 50		571 50
W. T. Hunt	Leveler	6 00 per	1,685 00	41 05	1,726 05
Mott Palmer	Leveler	6 00 per	1,362 50		1,362 50
L. S. Rickard	Leveler	5 00 per	1,570 00	3 34	1,573 34
G. M. Rodger	Leveler	4 50 per	727 50		727 50
J. A. Wallace	Leveler	4 50 per	720 00		720 00
B. Wich	Leveler	6 00 per	970 00	2 68	972 68
W. D. Zieley	Leveler	5 00 per	1,505 00		1,505 00
R. W. Anderson	Rodman	4 00 per	1,186 00		1,186 00
W. M. Bronk	Rodman	3 50 per	322 00		322 00
G. E. Deutschbein	Rodman	4 00 per	1,263 50		1,263 50
L. Greenalch	Rodman	3 50 per	374 50		374 50
R. Jerrell	Rodman	4 00 per	1,185 00		1,185 00
F. M. Kuchar	Rodman	3 50 per	63 00		63 00
H. J. O'Hara	Rodman	3 50 per	220 50		220 50
H. J. Richardson	Rodman	4 00 per	634 00	162 72	796 72
G. L. Stillman	Rodman	3 50 per	920 00		920 00
J. E. Cotter	Chainman	3 00 per	981 00		981 00
E. F. Donsert	Chainman	3 00 per	555 00		555 00
H. F. Egan	Chainman	3 00 per	297 00		297 00
Byron Houghtaling	Chainman	3 00 per	1,023 00		1,023 00
J. P. Kirvin	Chainman	3 00 per	602 50		602 50
H. S. Miller	Chainman	3 00 per	369 00		369 00
D. O'Connell	Chainman	3 00 per	944 50		944 50
J. J. Raup	Chainman	3 00 per	1,029 00		1,029 00
G. A. Rogers	Chainman	3 00 per	863 50		863 50
F. B. Stoddard	Chainman	3 00 per	488 00		488 00
H. J. Weir	Chainman	3 00 per	598 50		598 50
L. W. Donnelly	Inspector of masonry	5 00 per	1,725 00		1,725 00
F. B. Kraft	Inspector of masonry	5 00 per day	1,590 00		1,590 00
R. W. Scott	Inspector of masonry	3 50 per day	927 93		927 93

Construction of Barge Canal—Champlain Canal—(Continued).

Chapter 147, Laws of 1903, and amendatory laws.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
F. G. Tilton	Inspector of masonry	\$5 00 per day	\$1,670 00	\$3 48	\$1,673 48
T. B. Bowes	Foreman of borings	4 50 per day	1,518 50		1,518 50
Fred Betts	Laborer	2 00 per day	724 00		724 00
Robert Bowe	Laborer	2 00 per day	220 00		220 00
T. D. Clancy	Laborer	2 00 per day	326 00		326 00
W. C. Clark	Laborer	2 00 per day	260 00		260 00
D. H. Crow	Laborer	2 00 per day	672 00		672 00
T. J. Dailey	Laborer	2 00 per day	730 00		730 00
D. J. Dwyer	Laborer	2 00 per day	660 00		660 00
Chas. Farley	Laborer	2 00 per day	654 00		654 00
Cornelius Fitzgerald	Laborer	2 00 per day	662 00		662 00
Michael Goldschmidt	Laborer	2 00 per day	632 00		632 00
William Hoy	Laborer	2 00 per day	594 00		594 00
Louis Kaufmann	Laborer	2 00 per day	210 00		210 00
J. C. Kelso	Laborer	2 00 per day	672 00		672 00
George La Joy	Laborer	2 00 per day	228 00		228 00
William Maloney	Laborer	2 00 per day	626 00		626 00
James Mansfield	Laborer	2 00 per day	296 00		296 00
George Mayhew	Laborer	2 00 per day	230 00		230 00
A. McDougall	Laborer	2 00 per day	54 00		54 00
N. H. McHerd	Laborer	2 00 per day	148 00		148 00
H. H. McMasters	Laborer	2 00 per day	636 00		636 00
H. J. MacShalley	Laborer	2 00 per day	552 00		552 00
J. C. McShane	Laborer	2 00 per day	52 00		52 00
Patrick Murphy	Laborer	2 00 per day	698 00		698 00
Fred Nehill	Laborer	2 00 per day	210 00		210 00
James Nolan	Laborer	2 00 per day	334 00		334 00
J. H. Noonan	Laborer	2 00 per day	651 00		651 00
Hugh O'Connor	Laborer	2 00 per day	348 00		348 00
H. C. Parke	Laborer	2 00 per day	522 00		522 00
O. J. Park	Laborer	2 00 per day	136 00		136 00
John Rock	Laborer	2 00 per day	726 00		726 00
J. F. Ryan	Laborer	2 00 per day	658 00		658 00
Edward Shanahan	Laborer	2 00 per day	344 00		344 00
E. W. Smith	Laborer	2 00 per day	668 00		668 00
Robert Sweeney	Laborer	2 00 per day	228 00		228 00
John Vaughn	Laborer	2 00 per day	538 00		538 00
O. H. Whittenhall	Laborer	2 00 per day	654 00	326 00	980 00
F. Williams	Laborer	2 00 per day	222 00		222 00
W. M. Francis	Axeman and office assistant	2 50 per day	590 00		590 00
L. R. Hellner	Axeman and office assistant	2 50 per day	817 50		817 50
C. B. McMasters	Axeman and office assistant	2 50 per day	803 50		803 50
Nelson Mory	Axeman and office assistant	2 00 per day	214 00		214 00
Thomas Ryan, Jr.	Axeman and office assistant	2 50 per day	825 00		825 00
E. L. Casey	Boatman	3 00 per day	990 00		990 00
T. D. Clancy	Boatman	3 00 per day	483 00		483 00
J. J. Cleary	Boatman	3 00 per day	321 00		321 00
J. H. Coniff	Boatman	3 00 per day	1,014 00		1,014 00
F. H. Craig	Boatman	3 00 per day	987 00		987 00
J. H. Dolan	Boatman	3 00 per day	1,017 00		1,017 00
J. J. Finn	Boatman	3 00 per day	586 00		586 00
J. Fox	Boatman	3 00 per day	1,033 00		1,033 00
Edward Harrigan	Boatman	3 00 per day	906 00		906 00
J. P. King	Boatman	3 00 per day	891 00		891 00
J. F. Malin	Boatman	3 00 per day	238 00		238 00
J. F. Mitchell	Boatman	3 00 per day	1,098 00		1,098 00
John Powers	Boatman	3 00 per day	963 00		963 00
C. J. Smith	Boatman	3 00 per day	333 00		333 00
H. G. Streeter	Boatman	3 00 per day	191 00		191 00
P. J. Whalen	Boatman	3 00 per day	990 00		990 00
William Wolf	Boatman	3 00 per day	699 00		699 00
E. H. Bowker	Gage reader	7 00 per month	56 00		56 00
L. C. Brazier	Gage reader	12 00 per month	144 00		144 00
F. E. Chapman	Gage reader	8 00 per month	88 00		88 00
S. L. Cluett	Gage reader	7 00 per month	49 00		49 00
J. H. Donnelly	Gage reader	7 00 per month	84 00		84 00
W. E. Downing	Gage reader	7 00 per month	84 00		84 00
W. B. Dunstan	Gage reader	7 00 per month	84 00		84 00
Edward Durkin	Gage reader	7 00 per month	84 00		84 00
A. B. Fisher	Gage reader	7 00 per month	56 00		56 00
P. F. Gleason	Gage reader	7 00 per month	84 00		84 00

Construction of Barge Canal — Champlain Canal — (Concluded).

Chapter 147, Laws of 1903, and amendatory laws.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
E. G. Hayner	Gage reader	\$8 00 per month	\$32 00		\$32 00
Karl Hersog	Gage reader	5 00 per month	30 00		30 00
J. F. Hickey	Gage reader	8 00 per month	12 90		12 90
G. P. Noyes	Gage reader	7 00 per month	35 00		35 00
DeWitt Sicklar	Gage reader	8 00 per month	51 10		51 10
W. H. Sigsworth	Gage reader	7 00 per month	84 00		84 00
B. F. Thebo	Gage reader	7 00 per month	84 00		84 00
H. C. Tinker	Gage reader	7 00 per month	84 00		84 00
			\$110,977 89	\$7,903 48	\$118,881 37
Incidental Expenses					
Instruments, tools and appliances				\$59 36	
Office rent				1,156 14	
Fuel and light				434 35	
Stationery and printing				39 58	
Postage				167 87	
Telephone and telegraph				618 21	
Miscellaneous				3,617 91	
					6,093 42
Total					\$124,974 79

Bureau of Bridges.

Chapter 811, Laws of 1911.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
William R. Davis	Chief bridge designer and in- spector	\$375 00 per month	\$675 57		\$675 57
W. H. Yates	Supervising engineer	333 33 per month	55 55		55 55
A. G. Hayden	Bridge designer	175 00 per month	75 27		75 27
Total			\$806 39		\$806 39

Vliet Street Bridge, Cohoes.

Chapter 488, Laws of 1912.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
A. G. Hayden	Bridge designer	\$175 per month	\$11 67		\$11 67
F. A. Hermans	Bridge designer	150 per month	50 00		50 00
E. G. Semon	Bridge designer	150 per month	50 00		50 00
John McBride	Assistant engineer	5 per day	285 00		285 00
John Vaughn	Laborer	2 per day	114 00		114 00
Total			\$510 67		\$510 67

Building Dikes, Delaware River, at Port Jervis.

Chapter 537, Laws of 1912.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
D. B. La Du	Division engineer	\$350 per month		\$19 15	\$19 15
R. G. Finch	Assistant engineer	7 00 per day	\$14 00	13 38	27 38
J. J. Finn	Chauffeur	100 per month	9 20	12 90	22 10
Wayland Dickens	Leveler	4 50 per day	72 00		72 00
G. M. Rodger	Leveler	4 50 per day	72 00	194 21	266 21
Harvey Malcolm	Chainman	2 50 per day	40 00		40 00
Wm. Leffler	Laborer	2 00 per day	32 00		32 00
			\$239 20	\$239 64	\$478 84
<i>Incidental Expenses.</i>					
Miscellaneous				\$4 60	4 60
Total					\$483 44

Construction of Docks at Port of New York.

Chapter 547, Laws of 1912.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
R. G. Finch	Assistant engineer	\$7 00 per day	\$28 00	\$44 15	\$72 15
C. T. Kniskern, Jr.	Tracer	83 33 per month		7 75	7 75
Total			\$28 00	\$51 90	\$79 90

Minisceongo Bridge Pier.

Chapter 513, Laws of 1910.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
R. G. Finch	Assistant engineer	\$6 00 per day	\$6 00	\$7 94	\$13 94
H. J. O'Hara	Rodman	3 50 per day	21 00	2 32	23 32
			\$27 00	\$10 26	\$37 26
<i>Incidental Expenses</i>					
Postage				\$0 22	22
Total					\$37 48

Improvement of Mohawk River and West Canada Creek.

Chapter 132, Laws of 1911.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
R. G. Finch.....	Assistant engineer.....	\$7 00 per day	\$143 00	\$123 75	\$266 75
H. J. O'Hara.....	Rodman.....	4 00 per day	884 50	18 87	903 37
N. B. Epstein.....	Rodman.....	3 50 per day	73 50	1 97	75 47
John Edelstein.....	Chainman.....	2 50 per day	52 50	1 97	54 47
J. J. Taney.....	Chainman.....	3 00 per day	690 00		690 00
B. Z. Wildenberg.....	Chainman.....	2 50 per day	52 50	1 97	54 47
J. L. Daley.....	Boatman.....	3 00 per day	586 00		586 00
			\$2,482 00	\$148 53	\$2,630 53
Incidental Expenses.					
Office rent.....				\$66 50	
Fuel and light.....				2 50	
Stationery and printing.....				75	
Postage.....				6 03	
Telephone and telegraph.....				1 00	
Miscellaneous.....				83 37	
					160 15
Total.....					\$2,790 68

Surveys, Field Notes and Manuscript Maps.

Chapter 199, Laws of 1910; Chapter 511, Laws of 1912.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
C. D. Burrus.....	Engineering draftsman.....	\$6 00 per day	\$1,254 00		\$1,254 00
Edwin Hilborn.....	Assistant engineer.....	6 00 per day	1,824 00	\$783 85	2,607 85
S. E. Brettheimer.....	Leveler.....	5 00 per day	897 00		897 00
W. J. Bissell.....	Rodman.....	4 00 per day	1,161 00		1,161 00
J. H. Griffin.....	Rodman.....	3 50 per day	318 50		318 50
L. A. Hequembourg.....	Rodman.....	4 00 per day	1,006 00		1,006 00
A. A. Laughlin.....	Chainman.....	2 50 per day	117 50		117 50
Geo. Terwilliger.....	Chainman.....	3 00 per day	939 00		939 00
W. C. Clark.....	Laborer.....	2 00 per day	52 00		52 00
M. Mahoney.....	Laborer.....	2 00 per day	626 00		626 00
Chas. Larkin.....	Axeman and office assistant.....	2 50 per day	775 00		775 00
C. B. Davis.....	Boatman.....	3 00 per day	705 00		705 00
			\$10,075 00	\$783 85	\$10,458 85
Incidental Expenses.					
Stationery and printing.....				\$0 50	
Postage.....				50	
Miscellaneous.....				162 66	
					163 66
Total.....					\$10,622 51

Surveys for State Board of Claims.

Chapter 433, Laws of 1909; Chapter 513, Laws of 1910.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
R. G. Finch	Assistant engineer	\$6 00 per day	\$12 00	\$10 94	\$22 94
J. B. Maguire	Assistant engineer	6 00 per day	24 00	6 93	30 93
Wayland Dickens	Leveler	4 50 per day	36 00		36 00
G. M. Rodger	Leveler	4 50 per day	31 50		31 50
E. H. Leggett	Rodman	3 50 per day	7 00		7 00
Harvey Malcolm	Chainman	2 50 per day	15 00		15 00
B. Z. Wildenberg	Chainman	2 50 per day	5 00		5 00
Wm. Leffler	Laborer	2 00 per day	16 00		16 00
Incidental Expenses.			\$146 50	\$17 87	\$164 37
Miscellaneous				\$44 91	44 91
Total					\$209 28

Examination of Monuments and Maps.

Chapter 513, Laws of 1910.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
O. F. Lewis	Assistant engineer	\$6 00 per day	\$246 00	\$153 22	\$399 22
A. G. Chapman	Chief clerk	3,600 per year		25 60	25 60
Incidental Expenses.			\$246 00	\$178 82	\$424 82
Postage				\$0 26	
Miscellaneous				71 77	72 03
Total					\$496 85

Topographic Survey.

Chapter 811, Laws of 1911; Chapter 547, Laws of 1912.

In coöperation with United States Geological Survey.

C. R. Allen	\$37 50
Gail Blanchard	61 00
Jos. Boushear	49 00
G. W. Burrell	302 00
Melvin Company	51 33
P. A. Chamberlain	56 66
Geo. T. Chilton	101 50
C. E. Cooke	5 08
G. C. Curtis	183 00
Moses Douglass	18 00
Geo. Farney	433 00
Jerry Filkins	76 00
P. F. Fitzpatrick	100 00
J. I. Gayetty	188 78

Topographic Survey — (Concluded).

Chapter 811, Laws of 1911; Chapter 547, Laws of 1912.

In coöperation with United States Geological Survey.

W. R. Hamlin.....	\$454 00
E. E. Harris.....	85 00
E. F. Henderson.....	187 00
C. R. Henry.....	212 67
A. P. Hill.....	74 00
E. B. Hill.....	316 50
P. Hogan.....	188 50
A. J. Kavanagh.....	436 65
C. B. Kendall.....	278 11
R. A. Kiger.....	587 85
J. H. Le Feaver.....	145 00
Harvey Malcolm.....	119 00
J. F. McBeth.....	700 91
R. L. McCammon, Jr.....	219 83
Walter McCrea.....	301 00
G. H. McKinney.....	166 00
R. C. McKinney.....	297 00
J. B. Metcalfe, Jr.....	227 93
E. D. Monroe.....	381 33
W. H. S. Morey.....	990 83
W. J. Morrow.....	121 00
Geo. O'Connor.....	26 25
E. W. Paul.....	33 00
L. Pepin.....	124 00
Pepin and Mouso.....	11 00
J. M. Perkins.....	218 50
Roscoe Reeves.....	272 67
Wm. Richardson, Jr.....	183 00
K. E. Schlachter.....	154 00
H. S. Senseney.....	520 40
F. L. Shalibo.....	161 50
T. F. Slaughter.....	582 65
Olinus Smith.....	90 68
J. F. Swan.....	70 00
K. W. Trimble.....	454 00
J. M. Whitman, Jr.....	1,242 59
E. E. Witherspoon.....	435 18
Total.....	<u>\$12,732 38</u>

Hydrographic Survey.

Chapter 811, Laws of 1911; Chapter 547, Laws of 1912.

In coöperation with United States Geological Survey.

C. C. Covert.....	\$358 41
Lester Allen.....	36 00
W. O. Birdsall.....	65 00
G. H. Canfield.....	50 64
W. E. Coe.....	36 00
C. S. DeGolyer.....	225 93
O. W. Hartwell.....	26 15
W. A. James.....	412 78
A. Leschen Sons Rope Co.....	45 96
Geo. J. Lyon.....	75 03
M. J. Maguire.....	92 24
J. G. Mathers.....	16 83
Alexander McMillian.....	81 89
D. L. Orcutt.....	28 93
Mrs. C. S. Rolles.....	29 87
Mrs. Vashti Russell.....	36 00
Lester Sevarie.....	27 00
Frank Weber.....	203 35
Frank Zock.....	34 67
West Side Structural Co.....	19 08
Total.....	<u>\$1,901 76</u>

SUMMARY.

The foregoing tables are summarized as follows:

Ordinary Repairs to Canals.

1. Erie canal, chapter 810, Laws of 1911	\$7,289 81
2. Champlain canal, chapter 810, Laws of 1911.....	4,710 19

Construction of Barge Canal.

3. Head office account, chapter 147, Laws of 1903; chapter 82, Laws of 1912....	306,222 72
4. Erie canal, chapter 147, Laws of 1903; chapter 82, Laws of 1912.....	214,103 45
5. Champlain canal, chapter 147, Laws of 1903; chapter 82, Laws of 1912.....	124,974 79

Bureau of Bridges.

6. Bureau of bridges, chapter 811, Laws of 1911.....	806 39
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Special Work.

7. Vliet St. bridge, Cohoes, chapter 488, Laws of 1912	510 67
8. Building dikes, Delaware river, at Port Jervis, chapter 537, Laws of 1912....	483 44
9. Construction of docks at port of New York, chapter 547, Laws of 1912.....	79 90
10. Minisecongo bridge pier, chapter 513, Laws of 1910	37 48
11. Improvement of Mohawk river and West Canada creek, chapter 132, Laws of 1911.....	2,790 68

Special Surveys.

12. Surveys, field notes and manuscript maps, chapter 199, Laws of 1910; chapter 511, Laws of 1912	10,622 51
13. Surveys for State Board of Claims, chapter 433, Laws of 1909; chapter 513, Laws of 1910.....	209 28
14. Examination of monuments and maps, chapter 513, Laws of 1910.....	496 85
15. Topographic survey, chapter 811, Laws of 1911; chapter 547, Laws of 1912...	12,732 8
16. Hydrographic survey, chapter 811, Laws of 1911; chapter 547, Laws of 1912..	1,901 76
Total	<u>\$687,972 30</u>

TABLE OF CONTRACTS COMPLETED ON THE EASTERN DIVISION DURING THE FISCAL YEAR ENDED
SEPTEMBER 30, 1912.
Special Work.

CONTRACTOR.	Date of contract.	Character of work.	ACT		Appropriation.	Engineer's preliminary estimate	Contract price.	Final payment.
			Chap.	Year.				
E. S. Sickles.....	April 28, 1911	Reconstruction of the center pier (protection pier) of the draw bridge over Minnesota creek, Rockland county	513	1910	\$6,000 00	\$4,461 00	\$4,485 00	\$4,731 03

Construction of Barge Canal.
Chapter 147, Laws of 1903, and amendatory laws.

CONTRACTOR.	Date of contract.	Character of work	Engineer's preliminary estimate	Contract price, as affected by alterations.	Final payment.
Thomas F. Riley.....	Nov. 28, 1911	Contract No 14-R, Erie canal — Removing bodies from at No 14	\$533 00	\$723 80	\$628 60
Atlantic, Gulf & Pacific Co., ..	Aug. 9, 1908	Contract ..	1,380,760 00	1,481,691 75	1,378,956 17
Penn Bridge Co	Jan 7, 1910	Contract ..	137,155 36	149,252 81	140,222 45
J. D. Miller.....	May 25, 1910	Contract ..	72,000 00	46,800 00	46,800 00
Shanley-Morrissey, Inc.....	Nov. 23, 1908	Contract ..	1,175,023 00	1,024,291 85	946,167 98
E. M. Graves.....	May 26, 1910	Contract ..	778,960 00	518,828 96	517,222 70

TABLE OF CONTRACTS PENDING ON THE EASTERN DIVISION, SEPTEMBER 30, 1912.
Special Work.

CONTRACTOR.	Date of contract.	Character of work.	Act.		Appropriation.	Engineer's preliminary estimate.	Contract price, as affected by alterations.	Value of work done to September 30, 1912.
			Chap.	Year.				
Lathrop, Shea & Henwood Co.....	Oct. 21, 1911	The improvement of the channel and banks of the Mohawk river and West Canada creek at Herkimer..... Constructing a highway bridge over the Erie canal at Vliet street, Cohoes.....	132	1911	\$75,000 00	\$66,500 00	\$69,430 00	\$40,230 00
Aldrich & Hall, Inc.....	July 23, 1912		488	1912	7,000 00	5,130 00	5,710 50	4,090 00

Construction of Barge Canal.
Chapter 147, Laws of 1903, and amendatory laws.

CONTRACTOR.	Date of contract.	Character of work.	Engineer's preliminary estimate.	Contract price, as affected by alterations.	Value of work done to Sept. 30, 1912.
Empire Engineering Corporation...	April 18, 1905	Contract No. 1, Champlain canal — Hudson river, Northumberland to Fort Miller and Crocker's Reef to Fort Edward..... Contract No. 2, Erie canal — Through Waterford to contract No. 11..... Contract No. 2-E, Erie canal — Through Waterford to contract No. 11..... Contract No. 3, Champlain canal — Fort Miller to Crocker's Reef.....	\$619,846 00 1,022,640 00 263,189 40 760,576 00	\$580,423 57 990,075 56 307,022 57 657,273 09	\$474,400 00 694,390 00 274,610 00 633,290 00
Ferguson Contracting Co.*.....	April 3, 1905				
Holler & Shepard†.....	Dec. 8, 1909				
Sundstrom & Stratton.....	April 4, 1905				

EASTERN DIVISION: CONTRACTS.

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	May 22, 1906	Contract No. 8, Erie canal — Dams and locks at Scotin, Rotterdam and Cranesville	1,518,382 00	1,516,788 98	920,420 00
Pittsburg-Eastern Co.*	July 6, 1912	Contract No. 8-A, Erie canal — Lock No. 8 and substructure of dam	888,363 00	799,399 10	..
The Foundation Company†	May 21, 1906	Contract No. 11, Erie canal — From contract No. 2 to Mohawk river	1,671,385 00	1,333,198 80	1,190,440 00
Fort Orange Construction Company	Nov 7, 1908	Contract No. 12, Erie canal — Bridges on contract No. 18	12,303 50	10,171 00	9,930 00
Penn Bridge Company	Sept. 10, 1907	Contract No. 13, Erie canal — Bridges on contract No. 18			
Acme Engineering & Contracting Co.		er, Crescent to it and Munden- r, Canajoharie, — Bridges on locks at Amster- to Castle creek river, Munden- river, Canajo-	2,875,570 00	2,985,224 72	2,525,460 00
United Construction Co	Dec 20, 1906	Contract No. 20-D, Erie canal — Mohawk river, Yonkers to Herkford Flats	70,718 90	92,955 88	74,090 00
Th Southall Company*	Dec 29, 1906	Contract No. 24, Champlain canal — Guard-gate at Crook- er's Reef	883,926 00	842,417 08	57,580 00
Alexander Murdoch†	Mar 3, 1908	Contract No. 25, Champlain canal — Comstock to Dun- ham's Basin	836,220 76	812,286 46	744,290 00
Houston Burnard	Aug 20, 1909	Contract No. 27, Champlain canal — Dunham's Basin to Fort Edward	499,000 00	400,857 30	299,420 00
S Pearson & Son, Inc	Aug 2, 1909	Contract No. 27-A, Champlain canal — Dunham's Basin to Fort Edward	848,540 00	1,032,210 20	459,710 00
American Pipe & Construction Co.	Aug 18, 1909	Contract No. 29, Erie canal — Sterling creek to Herkimer Queida county line	370,000 00	385,720 00	594,190 00
American Pipe & Construction Co	Aug 18, 1909	Contract No. 30, Erie canal — Mohawk river, Little Falls to Sterling creek	2,260,000 00	2,685,477 40	276,890 00
Kingsbury Construction Company	Nov 1, 1911	Contract No. 31, Erie canal — Through Little Falls, Rocky Run dam	46,692 00	44,308 00	19,510 00
Atlantic, Gulf & Pacific Company	Nov 19, 1900	Contract No. 54, Champlain canal — Lock No. 7 at Fort Edward	1,849,831 00	1,707,191 80	1,525,560 00
Kinnet Construction Co*.	Nov 23, 1906	Contract No. 56, Champlain canal — Improvement of Glens Falls feeder	998,920 00	723,208 61	378,050 00
Holler & Shepard†	Dec 1, 1910	Contract No. 69, Champlain canal — Lock at lower Me- chanieville	409,455 00	486,464 25	211,370 00
Maryland Dredging & Contracting Co	April 3, 1909	Contract No. 70, Champlain canal — Hudson river, Water- ford to lock No. 1	812,350 00	691,250 36	451,110 00
Acme Engineering & Contracting Co	July 16, 1909		2,650,500 00	2,680,480 87	1,523,150 00
Casey & Murray	Sept 2, 1908		813,800 00	831,302 28	744,040 00
The Hunkin-Conkey Construction Co	Dec 13, 1909		232,908 00	251,370 10	194,150 00
Flood & Van Wirt Company	Sept 26, 1912		317,638 00	319,958 20	0
I A Hodge & Co., Inc	Dec 11, 1909		270,675 00	240,200 45	210,850 00
Shanley-Morrissey, Inc*.	Jan 11, 1910		749,300 00	779,036 50	236,240 00

* Suspended by order of the Canal Board

† Relet to complete former contracts.

TABLE OF CONTRACTS PENDING ON THE EASTERN DIVISION, SEPTEMBER 30, 1912 — (Concluded).
Construction of Barge Canal - (Concluded).
Chapter 147, Laws of 1903, and amendatory laws

CONTRACTOR.	Date of contract.	Character of work	Engineer's preliminary estimate	Contract price, as affected by alterations.	Value of work done to Sept. 30, 1912.
Shanley-Morrissey, Inc. *	Jan. 11, 1910	Hudson river, lock No	\$1,502,100 00	\$1,561,119 00	\$821,960 00
Shanley-Morrissey, Inc. *	Dec. 14, 1909	Hudson river, lower	1,439,733 00	1,221,111 75	616,900 00
Lathrop, Shea & Henwood Co	Sept 23, 1911	struction of a portion	41,871 00	43,440 00	4,940 00
Lathrop, Shea & Henwood Co . .	Nov. 4, 1911	Reconstruction of a	23,553 00	29,642 00	7,280 00
D'Olier Engineering Corporation .	April 12, 1910	Power-supply and main, Comstock and	94,093 65	92,311 53	87,940 00
The Hollington Company	Jan. 5, 1911	electric power-plant at Crescent dam.	44,600 00	44,965 50	30,090 00

* Suspended by order of the Canal Board

REPORT
OF THE
DIVISION ENGINEER
OF THE
MIDDLE DIVISION

For the Fiscal Year Ended September 30, 1912

MIDDLE DIVISION.

STATE OF NEW YORK,
DEPARTMENT OF STATE ENGINEER AND SURVEYOR,
MIDDLE DIVISION.

SYRACUSE, N. Y., *October 1, 1912.*

Hon. JOHN A. BENSEL, *State Engineer and Surveyor, Albany,
N. Y.:*

Sir.— I have the honor to submit herewith my annual report as Division Engineer of the Middle Division, New York State Canals, for the fiscal year ended September 30, 1912.

Navigation on the Erie canal was closed through the city of Syracuse from July 11 to 30, a period of 19 days, due to a break in the culvert at the crossing of Geddes brook just east of lock No. 50.

On the Black River canal a leak through the embankment across the ravine just above Delta dam necessitated drawing the water from the level on June 23. Repairs were made and navigation resumed June 30. Again on August 5, a leak occurred through the embankment at the lower end of the new aqueduct over the Black river below Delta dam. Repairs were made and navigation was resumed on August 8.

The Oswego canal was closed from lock No. 11, below Fulton, to Lake Ontario, to and including July 10, 1912, by the Superintendent of Public Works, under authority of Chapter 282, Laws of 1912. On April 1, 1912, the westerly third of High dam failed. The damage to the structure was so great that it was deemed inadvisable to make repairs. For this reason the lower end of the Oswego canal has been closed the entire season.

SPECIAL LEGISLATION.

CONSTRUCTION OF A LIFT BRIDGE OVER THE ERIE CANAL AT
FRANKLIN STREET, SYRACUSE.

(Chapters 453 and 527 of Laws of 1909 and 1910.)

The work was let to the Steel Storage and Elevator Construc-
tion Company of Buffalo, and later assigned to Charles B. Foster.

Engineer in charge, first year, L. D. Brownell.

Engineer in charge, second year, R. K. Sheldon.

Engineer's estimate	\$43,131 74
Contractor's bid	38,245 75
Final account, rendered September 23, 1912.....	37,112 37

IMPROVEMENT OF WEIGH LOCK BUILDING, SYRACUSE.

(Chapter 524, Laws of 1910.)

Contractor, The O. M. Edwards Company.

Engineer in charge, Carl F. Hopstein.

Engineer's estimate	\$9,817 40
Contractor's bid	9,231 50
Final account, rendered August 23, 1912.....	11,673 96

CONSTRUCTION OF HIGHWAY BRIDGE OVER THE BLACK RIVER
CANAL AT EAST DOMINICK STREET, ROME.

(Chapter 877, Laws of 1912.)

Contractor, Lupfer & Remick.

Engineer in charge, A. W. Smith.

Engineer's estimate	\$22,790 50
Contractor's bid	19,874 00
Work done to date.....	230 00

Chapter 510, Laws of 1912, provided for the construction of a reinforced concrete bridge over the Black River canal at Lyons Falls. A preliminary survey has been made for the purpose of preparing plans and an estimate of cost. Owing to an error in the wording of the bill, nothing further has been done.

Chapter 53, Laws of 1912, provides for the construction of a

new bridge over the Black River canal at Main street in the village of Boonville. Preliminary surveys have been made for this work.

BOARD OF CLAIMS.

Besides the work usually required by the Superintendent of Public Works in connection with ordinary repairs, many surveys have been made of property alleged to have been damaged by the State, and the data properly arranged for the use of the Board.

BLACK RIVER SURVEY.

(Chapter 190, Laws of 1911.)

The act provides for a survey, plans and estimate of cost, for a canal from Carthage to Sacketts Harbor.

Mr. Louis A. Burns, of Watertown, N. Y., was placed in charge, and started work on the surveys, August 1, 1911, and completed the work, April 10, 1912.

BLUE LINE SURVEY.

(Chapter 199, Laws of 1910.)

An act to provide for mapping of certain canal lands, and the lands adjacent thereto, belonging to the State.

The work on the Middle Division was assigned to Assistant Engineer E. C. Olcott. The necessary surveys to establish the old "red and blue lines" have been completed from Liverpool to lock No. 7 on the Oswego canal, a distance of about 16.5 miles, and from Cold Spring bridge over the Seneca river below the mouth of Onondaga lake outlet to the float bridge just below Baldwinsville, a distance of about 4.5 miles, or a total of about 21 miles.

The office work, including the necessary computations, mapping and tracing, have been completed from Mud lock, at the foot of Onondaga lake, to Hinmanville, below Phoenix, a distance of about 12.5 miles, and from Cold Spring bridge to Float bridge, as above, a distance of about 4.5 miles, or a total of about 17 miles.

The work was discontinued on October 19, 1912, for lack of funds. The work so far done on this Division is marked only with wooden markers. The work should be continued and permanent monuments placed. This should be done in the early future.

BARGE CANAL.

The Middle Division of the Barge canal extends from the east line of Oneida county to the south line of Wayne county, a distance of, including Oneida and Cross lakes, 107.4 miles. It also includes the Oswego branch, extending from Three Rivers to Oswego, about 25 miles, the Cayuga and Seneca branch, extending from Montezuma aqueduct to Seneca lake at Geneva, about 22 miles, and the territory covered by the Delta and Hinckley reservoirs in Oneida and Herkimer counties.

The main line of the Erie Barge canal is divided into four sections, *viz.*, Residencies Nos. 4-A, 5, 6 and 7.

Residency No. 4-A extends from Oneida county line to Oriskany road, a distance of 8.96 miles, and on this Division comprises contract No. 42. Earl Talbot is in charge, with headquarters at Utica.

Residency No. 5 extends from Oriskany road bridge to Oneida lake, a distance of about 22.25 miles, and comprises contracts Nos. 43, 44 and 4. Daniel B. Donovan is engineer in charge, with headquarters at Rome.

Residency No. 6 extends from deep water in Oneida lake to Baldwinsville, a distance of about 23.4 miles, and includes contracts No. 45, 57, 90, 101 and a portion of contracts Nos. 12, 13 and 22. D. C. Wedgeworth is engineer in charge, with headquarters at Syracuse.

Residency No. 7 extends from Baldwinsville to Wayne county line, a distance of about 32.7 miles, and includes contracts Nos. 5-A, 46, 22-A and parts of contracts Nos. 12 and 22. E. J. Berry is engineer in charge, with headquarters at Syracuse.

Residency No. 1, Oswego, extends from Three River Point to Fulton, a distance of about 13 miles, and includes contracts Nos. 10, 10-A, 10-B, 33, 39, 53, 78, 80, 85, 90, 90-A, 104, highways adjacent to contract No. 78 and Ox creek highways. T. M. Ripley is engineer in charge, with headquarters at Fulton.

Residency No. 2, Oswego, extends from Fulton to Oswego, a distance of about 10.58 miles. It comprises contracts Nos. 35, 37 and 79 and parts of contracts Nos. 90 and 90-A. James Burden is engineer in charge with headquarters at Oswego.

Water-Supply Residency comprises contracts Nos. 50, 51, 55 and 55-R; also highways adjacent to Delta reservoir. L. C. Hulburd, with office at Rome, was in charge of the residency until July, 1912, when it was divided and contract No. 51 was placed in charge of H. J. Morrison, with headquarters at Hinckley.

The Cayuga and Seneca Barge canal is divided into two residencies.

Seneca Falls Residency is in charge of L. S. Hulburd, with headquarters at Seneca Falls. It includes contract A and parts of contracts B, C, D and H.

Waterloo Residency is in charge of A. E. Steere, with headquarters at Waterloo. It includes contracts E and I and part of B.

The reports of the residency engineers on the division, which are appended, give in detail the work accomplished on the several contracts. Following these reports will be found tables giving the name, rank and salary of all the employees on the division. Tables showing in figures the status of each contract are also appended.

With the exception of three contracts on the Cayuga and Seneca canal and a few contracts for bridge construction and installation of operating machinery for some of the locks and other structures, the entire length of the canal across the division is under construction, as will be seen by an appended table, and some of the contracts are well toward completion.

I believe that in three years' time the canal work on the division will be practically completed and the canal ready for navigation.

The past year has seen the largest amount of work done since the beginning of Barge canal construction. The total for the year's work is \$3,528,835, and the percentage of work done during the year is 15.6. The total amount of work done since the commencement of Barge canal construction is \$12,329,752, and the percentage 54.7.

Table "A," appended, will show more fully than the above statement the status of the progress of the contracts.

In conclusion, I desire to commend to you for efficient and faithful service the entire engineering force of the division, and

thank you and Mr. Kastl, the Special Deputy, for the consideration and help you have given me in our efforts to carry on the work of the division.

Respectfully submitted,

EDWIN STYRING,
Division Engineer.

TABLE "A."
PROGRESS ON CONTRACTS, BARGE CANAL, MIDDLE DIVISION.
Erie and Oswego Canals.

CONTRACT NO.	Contract price, as affected by alterations.	Total amount of work done to October 1, 1912.	Work done during the year.	Per cent of work done to October 1, 1912.	Per cent of work done during the year.
4.....	\$726,708	\$720,073	0	Finished	0
4-B.....	1,351	1,333	\$1,333	Finished	Finished
5.....	156,941	125,820	0	80.2	0
5-A.....	317,597	239,990	230,990	75.5	75.5
7.....	44,408	41,797	0	Finished	0
10.....	1,111,965	668,360	0	60.1	0
10-A.....	174,514	88,600	88,600	50.8	50.8
10-B.....	487,545	76,240	76,240	14.8	14.8
12.....	3,558,146	2,598,510	477,680	73	13.4
13.....	28,126	20,180	0	71.7	0
22.....	127,521	40,500	25,540	31.8	20
22-A.....	27,099	0	0	0	0
33.....	30,918	24,891	0	.....	0
35.....	760,917	641,250	207,440	84.2	27.2
37.....	2,462,609	1,137,930	530,090	46.2	17.4
Road A.....	4,629	680	680	14.7	14.7
Road B.....	93,020	70,350	70,350	75.6	75.6
39.....	1,048,674	230,720	100,120	22	9.6
42.....	1,047,366	478,670	37,400	45.7	35.7
43.....	1,421,551	301,340	214,380	21.3	15.2
44.....	1,760,913	922,270	335,200	52.4	19
45.....	472,802	418,652	0	Finished	0
46.....	1,305,930	734,720	128,760	56.2	9.85
50.....	971,769	233,890	157,760	24	16.4
51.....	397,093	149,630	92,980	37.7	23.4
53.....	167,585	164,576	0	Finished	0
55.....	945,840	883,350	67,550	Finished	7.1
55-R.....	7,561	7,526	7,526	Finished	Finished
Highways on contract 55.....	46,387	45,315	19,625	Finished	42.5
57.....	93,596	0	0	0	0
78.....	49,026	50,068	3,708	Finished	7.5
Highway on contract 78.....	15,420	16,734	7,643	Finished	35.8
79.....	37,480	33,980	13,030	Finished	34.8
80.....	117,391	110,886	56,670	Finished	48.2
85.....	13,173	12,010	11,510	91.3	87.5
90.....	84,010	80,981	32,790	96.4	39
90-A.....	64,020	980	980	1.5	1.5
101.....	40,640	3,300	3,300	8.1	8.1
104.....	39,370	590	590	1.5	1.5
Ox creek highways.....	73,353	3,560	3,560	4.9	4.9

Cayuga and Seneca Canal.

A.....	\$376,233	\$208,680	\$126,230	55.5	33.6
B.....	1,436,597	740,820	391,220	51.5	27.2
H.....	216,510	0	0	0	0
I.....	215,639	0	0	0	0
Totals.....	\$22,580,015	\$12,329,752	\$3,528,835	54.7	15.6

APPENDED REPORTS—MIDDLE DIVISION.

Resident Engineers' Reports on Barge Canal Construction.

ERIE CANAL, RESIDENCY No. 4-A.

Resident Engineer Earl Talbot reports:

Contract No. 42.

This contract extends from the Oneida-Herkimer county line to Oriskany road, a distance of 8.96 miles.

The work was originally let to Shanley-Morrissey, Incorporated. The original contract has been cancelled, but the work is to be relet soon on new plans covering the work remaining to be done.

Charles R. Chase is Assistant Engineer in charge of the engineering on this contract, with office attached to the residency in Utica. The Whitesboro office was moved to Utica in August, 1912.

Work on this contract was begun by Shanley-Morrissey, Incorporated, in the latter part of July, 1909, and was continued by them during the remainder of that year, 1910, and in 1911. A small amount of work was undertaken by the contractors in 1912, but all operations on the contract were stopped early in March and the plant was closed down, with the exception of the watchman left in charge. This action led to the suspension of the contract by resolution of the Canal Board on May 8, 1912, and further negotiations resulted in the cancellation of contract No. 42 by resolution of the Canal Board on July 18, 1912, the contractors being unable to proceed with the work.

During that portion of the current year in which the contracting operations were under way no work was done upon that portion of the canal lying west of Carey road.

Very little work has been accomplished during the year at the dive culverts.

The superstructure of Park avenue bridge was placed by subcontractor on work extending into the spring of 1912. The reinforced concrete floor of the bridge has not been placed.

The stream entrance at Real's creek was completed, as was also that at Schuyler street.

A large amount of material was hauled for the substructure of North Genesee street bridge, but no work was done at this point.

Practically no work is done between North Genesee street and Schuyler road, except some trimming of banks.

One of the drag-line revolving excavators was taken to the site of the river-straightening work south of Sta. 5585, having been taken across the Mohawk river at about that station with considerable difficulty. This machine has excavated practically all of the south half of the river-straightening channel, leaving only enough material in place to keep the river out. This machine was in operation when the work shut down in March.

The 12-inch suction dredge was taken back from the prism and lock approach excavation, and placed behind the coffer-dam just east of the approach to lock No. 20 and used as the pumping unit for unwatering the lock site. After the installation of the dredge, steam-shovel work was undertaken, going west through the lower lock approach. At the same time foundation piles were driven under the approach wall on the south side and some foundation piles under the lower approach wall on the north side.

About 600 feet of foundation and 400 feet of guide wall have been concreted, beginning with the western end of the south upper guide wall.

Considerable plant was installed at the lock, preparatory to further concreting.

The engineering force has been actively engaged in getting out plans, specifications and estimate for contract No. 42-A, which is now ready to be submitted to the Canal Board for approval. In addition to this, a great deal of work has been done upon the final estimate of contract No. 42.

The following table shows the percentage of work done from

Boat devised for trimming prism banks to proper slope

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October 1, 1911, to March 12, 1912, and the total amount of work done to date upon the various contract items:

ITEMS OF WORK.	Preliminary estimate, as affected by alterations Nos. 1 to 6 and 8.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Clearing.....acres	28	0	14.52	0	51.8
Grubbing.....cu. yds.	37,120	0	27,483	0	74.2
Excavation.....cu. yds.	2,736,520	81,708	1,884,991	3	69
Sheeting and bracing.....ft. B. M.	279,000	5,900	61,720	2.1	22
Embankment.....cu. yds.	643,100	715	277,371	0.1	43.1
Lining.....cu. yds.	3,856	0	242	0	6.27
Puddle.....cu. yds.	320	0	0	0	0
Sawed lumber, yellow pine or Douglas fir, ft. B. M.	8,500	0	6,030	0	71.7
Sawed lumber needles, yellow pine...ft. B. M.	11,000	0	0	0	0
Creosoted lumber.....ft. B. M.	54,000	0	0	0	0
White oak lumber.....ft. B. M.	8,500	0	0	0	0
Foundation piles, 12 to 30 ft. long....lin. ft.	115,920	12,723	31,636	11	27.3
Sheet-piling.....ft. B. M.	786,200	10,530	453,620	1.3	57.7
Second-class concrete.....cu. yds.	35,014	1,539.1	3,326.3	4.5	9.5
Reinforced concrete.....cu. yds.	2,264	0.4	292.5	.....	12.9
Bridge coping.....cu. yds.	15.7	1.63	4.89	1	31
Wash wall.....cu. yds.	60	0	0	0	0
Second-class paving.....sq. yds.	2,613	0	0	0	0
Second-class riprap.....cu. yds.	2,345	0	0	0	0
Structural steel.....lbs.	1,320,000	243,464	560,566	18.8	42.5
Metal reinforcement.....lbs.	265,900	0	30,244	0	11.4
Wrought iron.....lbs.	2,270	0	0	0	0
Steel castings.....lbs.	15,660	0	0	0	0
Wooden pavement.....sq. yds.	810	18.6	791.4	2.3	97.7
Wood block pavement.....sq. yds.	1,375	0	0	0	0
Wooden fence.....lin. ft.	4,535	600	600	13.2	13.2
Iron pipe railing.....lin. ft.	760	0	0	0	0
Lattice railing.....lin. ft.	770	424	424	55	55
Metal in lock-gates.....lbs.	220,000	0	0	0	0
Metal in buffer-beams.....lbs.	85,000	0	0	0	0
Metal in lock-valves.....lbs.	34,000	0	0	0	0
Maintaining highway traffic.....lump sum	.....	0	12.5%	0	12.5
Bailing and draining.....lump sum	.....	4%	4%	4	4

Percentage of total work done to date = 45.7 per cent.

ERIE CANAL, RESIDENCY NO. 5.

Acting Resident Engineer Daniel B. Donovan reports:

Contract No. 43.

This contract extends from the Oriskany road on the east to about 1,500 feet west of Mud creek, a distance of 10.32 miles. This contract was awarded to The M. A. Talbott Company on October 15, 1909, for \$1,320,560 and has since been increased by alterations to \$1,421,550.90.

The construction of this section of the canal has also necessitated the relocation of the main line of the New York Central

railroad about a mile southerly of its present location and crossing overhead the Utica & Mohawk Valley Electric railway, the New York, Ontario & Western railroad, several streets and the Mohawk river, on concrete arches and steel bridges, the change being about $3\frac{1}{2}$ miles in length and requiring 1,600,000 cubic yards of embankment, of which 900,000 cubic yards has been completed, and 20,200 cubic yards of concrete constructed. The double arch over the Mohawk river spillway, the double arch for the Utica & Mohawk Valley Electric Railway and Mill street, the Erie canal, Lawrence and James street arches, and also the bridge over the New York, Ontario & Western railroad have been completed. The New York, Ontario & Western railroad has been relocated, new buildings constructed, and a bridge across the Barge canal for this railroad completed. The Utica & Mohawk Valley Electric railway has been relocated and a bridge across the Barge canal for this railway has been constructed. Work is now progressing on the relocation of over a mile of the Rome, Watertown & Ogdensburg division of the New York Central railroad, the concrete arch over the Muck road being completed and the bridge over the Barge canal being in course of construction.

The construction of the Barge canal has also progressed rapidly on this contract. Early in the year the contractor erected a double-cableway drag-line excavator at the east end of the contract near Oriskany. This machine is the first of its kind to have been operated in this country and has done excellent work in excavating the canal, sloping the banks and in constructing embankment. It will excavate approximately 50,000 cubic yards per month.

The hydraulic dredge *Stanwix* has worked from Mill street westwardly to the west crossing of the New York Central railroad, also excavating a wide-water or turning basin some 250 feet in width and 2,000 feet in length on the south side of the canal between Lawrence and James streets, the excavated material from the prism and wide-water being placed in the New York Central railroad embankment. The diking for the dredge and the re-handling of material are being done by three Lidgerwood drag-line excavators. About 787,000 cubic yards have been excavated by the dredge. There has also been constructed and placed in

BARGE CANAL, CONTRACT NO. 43.
Excavation of prism by a double-cableway drag-line excavator.

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operation a sloping boat, used in connection with the dredge for sloping the banks of the canal.

The steel superstructures of the highway bridges at Oriskany over the Barge canal and river channel, the Mill Street bridge superstructure at Rome and the Nine-Mile creek spillway and sluiceway have been completed and the contractor has erected plant for the construction of the east guard-gate and spillway, also the west guard-gate, junction lock and retention dam at Rome.

The following table shows the percentage of work done on each item of the contract, percentage done during the year and the whole amount of work done to date:

ITEMS OF WORK.	Preliminary estimate, as affected by alterations.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Clearing.....acres	140	3.48	7.78	2.6	5.6
Excavation.....cu. yds.	5,306,855	915,112	1,258,484	17.3	23.8
Sheeting and bracing.....ft. B. M.	209,600	972	23,160	0.4	11
Forming embankment.....cu. yds.	254,400	61,118	61,118	24	24
Foundation piles.....lin. ft.	66,524	1,512	13,427	2.3	20.2
Wooden sheet-piling.....ft. B. M.	377,100	3,672	104,112	1	27.6
Second-class concrete.....cu. yds.	22,148	1,170	3,827	5.3	17.1
Reinforced concrete.....cu. yds.	1,194	27	27	2.3	2.3
Structural steel.....lbs.	589,400	559,300	559,300	95	95
Metal reinforcement.....lbs.	95,200	3,497	3,497	3.7	3.7
Wrought iron.....lbs.	2,700	1,318	1,318	49	49
Maintaining highway traffic.....lump sum	\$8,000	\$6,080	\$6,080	76	76
Coffer-dams, etc.....lump sum	\$12,000	\$1,920	\$1,920	16	16
Stone curbs.....lin. ft.	680	492	492	72.3	72.3
Cresoted lumber.....ft. B. M.	22,600	21,040	21,040	93.1	93.1
Wooden pavement.....sq. yds.	488	467	467	95.7	95.7
Lattice railing.....lin. ft.	192	187	187	97.4	97.4

Total of all work done during year = 15.1 per cent of estimated cost.

Total of all work done to date = 21.2 per cent of estimated cost.

Contract price, including alterations = \$1,421,550.90.

Cost of work done to date = \$301,340.

Cost of work done during year = \$214,380.

Contract No. 44.

This contract extends from contract No. 43, 1,500 feet west of Mud creek, to the east end of contract No. 4, a distance of 7.8 miles, and was awarded on January 28, 1910, to Scott Bros. for \$1,748,679, and has been increased by alterations Nos. 1 to 7 to \$1,760,913.

On this contract the Erie canal at New London divides the excavation into two parts. East of the canal crossing the contractors have had in operation three steam-shovels, two with narrow gage

track outfit and one with incline tippie. West of the canal they employed two tower scrapers and a steam-shovel, also several derricks have been used for excavation in the locks.

East of the Erie canal there has been removed 320,724 cubic yards during the year and there remain 315,276 cubic yards to be removed. West of the Erie canal 474,996 cubic yards have been removed and there remain 425,004 cubic yards, including the locks and junction lock.

At Stony brook entrance and spillway no work has as yet been done.

At the junction lock about 1,800 cubic yards of concrete have been placed in the south lock wall.

No work has been done at the New London road bridge during the past year.

The spillway and dive culvert near Sta. 6550 have been completed, and also the ditch entrance to the culvert. At lock No. 21 nearly all of the concrete has been placed with the exception of a small part of the lower approach wall. Steel gates and buffer-beams are now being erected. This lock has a lift of 25 feet. At lock No. 22 the greater part of the excavation for the lock proper has been completed and about 8,000 cubic yards of concrete have been placed in the north and south walls.

The following table shows the amounts and percentages of work done during the year and to date:

ITEMS OF WORK.	Preliminary estimate, as affected by alterations.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Clearing.....acres	100	1.09	97.39	1.09	97.39
Excavation.....cu. yds.	3 243,970	586,344	1,993,403	18.1	61.5
Sheeting and bracing.....ft. B. M.	740,000	121,846	438,524	16.5	59.3
Round timber bracing.....lin. ft.	9,470	401	7,959	4.2	84
First-quality steel piling.....sq. ft.	55,000	0	55,056	0	100
Second-quality steel piling.....sq. ft.	132,000	37,525	37,525	28.4	28.4
Forming embankment.....cu. yds.	172,000	16,380	76,976	9.5	44.7
Lining.....cu. yds.	5,450	151	187	2.8	3.4
Puddle.....cu. yds.	800	0	61	0	7.6
Sawed lumber.....ft. B. M.	68,900	1,038	5,016	1.5	7.3
Foundation piles.....lin. ft.	67,650	6,148	35,886	9.1	53
Mooring piles.....lin. ft.	770	0	135	0	17.5
Wooden sheet-piling.....ft. B. M.	1 144,000	40,824	932,641	35.7	81.5
Second-class concrete.....cu. yds.	93,150	24,498	43,767	26.3	47
Reinforced concrete.....cu. yds.	550	72	503	13.1	91.5
First-class masonry bridge coping.....cu. yds.	5	1.65	1.65	33	33
Second-class stone paving.....sq. yds.	3,460	597	752	17	21.7
Structural steel.....lbs.	319,000	48,599	264,450	15.2	82.9
Metal reinforcement.....lbs.	113,000	31,629	88,543	28	78.3
Steel castings.....lbs.	44,000	4,185	7,287	9.5	16.6
Iron castings, plain.....lbs.	1,400	339	678	24.2	48.4

BARGE CANAL, CONTRACT NO. 44.

**Construction of lock No. 22, near New London, where the soil is chiefly sand
and gravel**

BARGE CANAL, CONTRACT NO. 44.

Stream entrance paving and prism excavation in soft material.

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ITEMS OF WORK.	Preliminary estimate, as affected by alterations.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Iron castings, machined.....lbs.	67,000	23,091	44,848	34.5	66.9
Wooden pavement.....sq. yds.	700	135	662	19.3	94.6
Metal in lock-gates.....lbs.	705,000	71,770	71,770	10.2	10.2
Metal in buffer-beams.....lbs.	260,000	31,900	31,900	12.3	12.3
Metal in lock-valves.....lbs.	147,000	23,242	23,242	15.8	15.8
Maintaining highway traffic.....lump sum	\$1,500	\$675	\$975	45	65
Coffer-dams, etc.....lump sum	\$21,000	\$5,880	\$14,490	28	69
Excavation and embankment in lieu of sheeting and bracing.....lump sum	\$31,385.40	\$18,831.24	\$18,831.21	60	60

Total of all work done during year = 19 per cent of estimated cost.

Total of all work done to date = 52.4 per cent of estimated cost.

Contract price, including alterations Nos. 1, 2, 3, 4, 5, 6, 7 = \$1,760,913.35.

Cost of work done to date = \$922,270.

Cost of work done during year = \$335,200.

Contract No. 4.

This contract extends from the west end of contract No. 44 to deep water in Oneida lake and was practically completed something like two years ago. A concrete apron, however, was placed on the Wood creek dam during the year.

Contract No. 4-B.

This contract was for the construction of a culvert under the highway bridge at Burdick's road near the eastern end of contract No. 4 and was completed a year ago.

ERIE CANAL, RESIDENCY No. 6.

Resident Engineer D. C. Wedgeworth reports:

Contract No. 12.

This contract was let to the Stewart-Kerbaugh-Shanley Co. of New York city on September 23, 1907. An assignment to James Stewart & Co. was approved by the State Engineer on August 25, 1910.

The total length of this contract is 43.7 miles, extending from deep water in Oneida lake to Mosquito Point bridge over the Seneca river. Of this distance 22.5 miles is in Residency No. 3 and the remainder in Residency No. 7.

The close of the year of 1911 found the prism excavation from Three Rivers, Sta. 3290, to Baldwinsville nearly completed.

Dredges were kept at work over this section until December 22, when they were moved to Baldwinsville for repairs and laid up for the winter.

At lock No. 23 the excavation was carried far enough to allow the laying of the bottom and foundations of the side walls of the lock, and the work left for the winter about the middle of December. The winter was spent in overhauling machinery and making repairs.

During April, 1912, work was begun at lock No. 23, some time being required to pump out and clean up the site before beginning the season's work.

Concrete work was soon under way and has been carried on as rapidly as possible. The lock proper is finished. The gates are hung and backfilling and embankment nearly completed.

With the opening of spring attention was again given to the prism excavation along the Oneida river and its cut-offs, on which no work had been done for sometime. Early in May three dredges were at work between Three Rivers and Oak Orchard. These dredges have worked nearly the whole season on this section and the work is practically completed. On July 2, the ladder dredge, which has lain for two seasons in Brewerton cut, was started, doing all the work possible before the lock is finished, when the cut will be finished, letting the water down against the gates.

The season's work has been pushed with vigor, with the results as shown in the accompanying table, which is for the whole contract, including sections in both Residencies Nos. 6 and 7.

ITEMS OF WORK.	Preliminary estimate, as affected by alterations Nos. 1, 3, 4 6, 7, 8, 10 and 11.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Clearing lump sum	\$8,800	\$114 40	\$4,716 80	1.3	53.6
Grubbing cu. yds.	12,120	0	8,036	0	66.3
All excavation, division No. 1 cu. yds.	1,190,000	149,892	1,050,131	12.6	88.2
All excavation, division No. 2 cu. yds.	700,000	18	615,916	0	88
All excavation, division No. 3 cu. yds.	2,453,400	151,217	1,686,196	37.5	68.7
All excavation, division No. 4 cu. yds.	3,383,700	703,083	1,916,262	20.8	56.6
Sheeting and bracing ft. B. M.	119,000	0	28,000	0	23.3
Forming embankment cu. yds.	131,900	16,125	66,631	12.2	50.5
Lining cu. yds.	1,330	0	490	0	36.8
Sawed lumber, yellow pine or Douglas fir, ft. B. M.	539,300	0	36,000	0	6.7

BARGE CANAL, CONTRACT No. 12.
Draft tube forms for power plant at lock No. 23.

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ITEMS OF WORK.	Preliminary estimate, as affected by alterations Nos. 1, 3 4, 6, 7, 8, 10 and 11.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Sawed lumber in miter-sills and gates, ft. B. M.	8,000	1,850	1,850	23.1	23.1
Sawed lumber, white oak ft. B. M.	84,020	0	0	0	0
Sawed lumber, creosoted, yellow pine, ft. B. M.	16,000	0	0	0	0
Round timber in cribs lin. ft.	103,400	0	0	0	0
Stone filling cu. yds.	11,400	0	0	0	0
Foundation piles, 12 ft. long No.	39	0	33	0	84.1
Foundation piles, 20 ft. long No.	180	0	71	0	39.4
Foundation piles, 25 ft. long* No.	0	0	16	0	0
Foundation piles, 30 ft. long* No.	0	0	1	0	0
Mooring piles, 16 ft. long No.	20	0	0	0	0
Mooring piles, 25 ft. long No.	63	0	0	0	0
Docking piles, 25 ft. long No.	2,333	0	0	0	0
Second-class concrete cu. yds.	32,806	15,637	19,561	47.8	59.6
Reinforced concrete† cu. yds.	407	0	849	0	170.9
First-class masonry bridge coping cu. yds.	10	0	7	0	70
Wash wall cu. yds.	8,512	0	50	0	0.6
Cobblestone paving sq. yds.	120	0	30	0	25
Third-class riprap cu. yds.	1,010	0	110	0	10.9
Structural steel lbs.	653,660	8,210	565,317	1.7	85.9
Metal in lock-gates lbs.	200,000	170,745	172,316	85.4	86.2
Metal in needle-dams lbs.	80,000	51,635	51,955	64.6	64.9
Metal in lock-valves lbs.	26,000	21,353	21,353	82.1	82.1
Metal reinforcement lbs.	81,400	6,652	63,071	8.1	77.5
Iron castings, plain lbs.	30,700	5,603	5,716	18.2	18.6
Iron castings, machined lbs.	22,500	10,206	20,412	45.4	90.7
Wooden fence lin. ft.	3,400	0	0	0	0
Fender fastenings No.	836	0	0	0	0
Removing old tree dam at Oak Orchard, lump sum	\$1,100	0	0	0	0
Raising bridge superstructure lump sum	\$1,100	0	\$1,100	0	100
Maintaining highway traffic lump sum	\$6,600	\$237.60	\$3,762	3.6	57
Deduct for buildings lump sum	\$2,700	0	0	0	0
Deduct for bridge superstructures, lump sum	\$1,350	0	\$1,350	0	100
Deduct for sheeting and bracing reused, ft. B. M.		0	18,600	0	
Gross estimate	\$3,558,145.84	\$477,640	\$2,598,510	13.4	73

* Found necessary to use longer piles than called for in preliminary estimate.
† Increase of 540 cu. yds. of reinforced concrete authorized by resolution of Canal Board, dated May 26, 1909.
Engineer's estimate, \$3,052,560; contract price, as affected by alterations, \$3,553,145.84.

Contract No. 45.

This contract is for the construction of a dam at Caughdenoy and of lock No. 24 and appertaining structures at Baldwinsville, and is 0.55 mile in length. The contract was let to Scott Bros. on May 6, 1908.

This contract was completed during 1910.

Contract No. 13.

The part of this contract on this residency is for the construction of steel highway superstructures at Stas. 2901 + 83, 2960 and 3185 + 48.

This contract was let to the Penn Bridge Co. on Nov. 7, 1908. The structures at Stas. 2960 and 3185+48 were completed last year. No work has been done this year. The following table shows the condition to date:

ITEMS OF WORK.	Preliminary estimate, as affected by alteration No. 1.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Structural steel lbs.	64,000	0	225,576	0	37.3
Sawed lumber, yellow pine ft. B. M.	11,130	0	4,771	0	33.8
Wooden pavement sq. yds.	1,625	0	613.4	0	35
Setting stone coping cu. yds.	10	0	3.23	0	32.8
Gross estimate	\$17,955.30	0	\$10,250	0	57.1

Contract No. 57.

This contract is for the construction of the canal through Onondaga lake outlet. The length of the contract is 0.85 of a mile. This contract was let to the N. Y. State Dredging Corporation on Aug. 6, 1912. Work has not commenced.

Contract No. 101.

Contract No. 101 is for the construction of a highway bridge over the Erie canal at Three Rivers, Sta. 3293+43. This contract was let to Barrally & Ingersoll on Aug. 8, 1912. Work was commenced immediately and at present the approaches to the bridge are well along; excavation for the north abutment is finished and piles driven. Concrete work on this abutment has begun.

The following table will show the amount of work done:

ITEMS OF WORK.	Preliminary estimate.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Coffer-dam, pumping, bailing and draining lump sum	\$2,000	\$500	\$500	25	25
Excavation cu. yds.	15,500	4,378	4,378	28.2	23.2
Forming embankment for bridge approaches cu. yds.	14,100	4,101	4,101	29.1	29.1

ITEMS OF WORK.	Preliminary estimate.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Lining.....cu. yds.	149	0	0	0	0
Treated yellow pine sawed lumber...ft. B. M.	30,000	0	0	0	0
Foundation piles.....lin. ft.	6,550	0	0	0	0
Second-class concrete.....cu. yds.	1,720	0	0	0	0
Third-class concrete.....cu. yds.	63	0	0	0	0
Structural steel.....lbs.	309,000	0	0	0	0
Metal reinforcement.....lbs.	1,100	0	0	0	0
Wooden fence.....lin. ft.	4,100	0	0	0	0
Stone paving.....sq. yds.	10	0	0	0	0
Gross estimate.....	\$40,639.50	\$3,304.15	\$3,304.15	8.1	8.1

Engineer's estimate, \$44,599.50; contract price, \$40,639.50.

Contract No. 90.

The part of this contract on this residency is for furnishing and installing equipment for operating and lighting lock No. 24, Erie canal, at Baldwinsville. This contract was let to the D'Olier Engineering Co. on April 6, 1910.

While this lock was nearly completed last year, it has taken some time to get all the machinery and electrical work in shape for the tests which have been made. This work is complete with the exception of a little work to be done under an additional work order.

The following table shows the work as done to date:

ITEMS OF WORK.	Preliminary estimate, as affected by alterations Nos. 1, 2 and 3.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Excavation.....cu. yds.	127	2.63	86.53	2	68.2
Chipping concrete.....cu. ft.	43	1.63	28.63	3.8	66.6
Forming embankment.....cu. yds.	104	1.19	61.19	1.1	58.8
Second-class concrete.....cu. yds.	26.1	1.45	17.45	5.2	66.9
First-class reinforced concrete.....cu. yds.	112	14.64	115.64	13.1	103.3
Structural steel.....lbs.	29,303	2,693.32	29,616.32	9.2	101.2
Metal reinforcement.....lbs.	6,650	1,402.23	7,572.23	21.1	114.2
Iron castings, plain.....lbs.	16,100	0	14,910	0	92.6
Metal ducts.....lbs.	3,502	229.98	3,893.93	6.6	111.2
Repaving gutters.....sq. yds.	130	0.77	109.77	0.6	84.4
Wrought iron pipe railing.....lin. ft.	34	0.34	32.34	1	95
Concrete conduit, single duct.....lin. ft.	2,390	0.5	2,275.5	0	95.2
Concrete conduit, double duct.....lin. ft.	553	0.3	534.3	0.01	96.2
Reinforced concrete conduit, double duct.....lin. ft.	40	0.4	39.4	1	98.5
Drilling 1½-in. holes.....lin. ft.	39.5	0.8	39.8	2	100.8
Drilling 3-in. holes.....lin. ft.	123.5	8.24	105.24	6.7	85.2
square roofing.....sq. yds.	12	12.04	12.04	100.3	100.3

ITEMS OF WORK.	Preliminary estimate, as affected by alterations Nos. 1, 2 and 3.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Painting..... sq. yds.	225	209 55	209 55	93 2	93 2
3-in. fiber duct..... lin. ft.	133	3	88	2 2	66 2
Lead covered, insulated, rubber conductors..... lbs.	9,220	797 1	9,927 1	8 7	107 7
Generators with switch-board..... lump sum	\$3,050	0	\$3,050	0	100
Governors..... No.	2	0	2	0	100
Head gates..... No.	2	0	2	0	100
Traveling crane..... No.	1	0	1	0	100
Electric capstans..... No.	2	0	2	0	100
Turbine machinery..... No.	2	0 04	2	2	100
Doors, windows, and woodwork..... lump sum	\$175	\$17 50	\$175	10	100
Miscellaneous electrical equipment..... lump sum	\$4,445	\$666 75	\$4,445	15	100
Maintenance accessories..... lump sum	\$30	\$6	\$30	20	100
Coffer-dams, etc..... lump sum	\$100	\$45	\$100	85	100
Valve-operating machinery..... lbs.	15,500	7,317	13,837	47 2	89 3
Gate-operating machinery..... lbs.	24,875	8,492	20,371	34 2	81 9
Lamp poles..... No.	13	0	13	0	100
3-horse-power motors..... No.	4	3	4	75	100
7½-horse-power motors..... No.	4	3	4	75	100
Gross estimate.....	\$30,619 59	.....	\$31,302 76	.....	102 2

Contract No. 22.

The part of this contract on this residency is for the raising of the bridge at Cold Spring. No work has been done at this point.

ERIE CANAL, RESIDENCY NO. 7.

Resident Engineer Edward J. Berry reports:

Contract No. 12, Section 7.

This contract extends from deep water in Oneida lake to Mosquito Point bridge. The total length of the contract is 43.75 miles. That portion of the contract extending from Oneida lake to Baldwinsville is in Residency No. 6. The portion from Baldwinsville to Mosquito Point bridge is in Residency No. 7, and is 21.25 miles in length. The contract was let to the Stewart-Kerbaugh-Shanley Co. of New York city on September 23, 1907, and was assigned to James Stewart & Co. on August 25, 1910.

Good progress has been made on this contract during the past year. During the fall of 1911, dredges Nos. 1, 4 and 5 worked

west from Hickory island, dredging prism channel. These dredges progressed about four miles and on December 23, 1911, they were closed down for the winter.

On May 4, 1912, the dredges again began work at the west end of contract and while no long stretch of the prism is finished, a very considerable portion needs only a small amount of cleaning up to leave it in a finished condition.

The table showing the amount of work done on this contract during the fiscal year is given in connection with the report on Residency No. 6.

Contract No. 22.

This contract is for constructing new highway bridges and raising existing highway bridges over the Erie canal between Cold Spring and Free bridges, constructing the necessary new substructures and constructing new bridges over the State ditch and Bonta's bridge. The contract was awarded to M. Fitzgerald on September 14, 1910.

At Free bridge the new concrete south abutment and the concrete pier have been completed. Foundation piles have been driven for the wings of the new north abutment and the embankment in the north and south approaches is nearly completed.

At Bonta's bridge new concrete piers Nos. 1 and 2 have been built and the excavation for the new south abutment is nearly finished. The north span of the new steel superstructure is erected, riveted and painted. The middle span is erected in place and bolted.

The Weedsport bridge was practically completed under contract No. 22, when the north abutment failed on November 25, 1911, as noted on contract No. 22-A.

At Jordan bridge the new concrete south abutment and pier pedestals are built and the embankment in the south approach has been placed.

At State ditch bridge the new concrete substructure has been completed. No work has been done at Cold Spring bridge.

The accompanying table shows the amount of work done during the year and to date:

ITEMS OF WORK.	Preliminary estimate, as affected by alterations Nos. 1 and 2.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Excavation.....cu. yds.	35,400	4,842	16,886	13.7	47.7
Forming embankment for bridge approaches.....cu. yds.	22,700	1,853	11,995	8.2	52.8
Lining.....cu. yds.	1,820	43	43	2.4	2.4
Sawed lumber, yellow pine.....ft. B. M.	61,000	9,000	9,000	14.8	14.8
Foundation piles 17 to 20 ft. long.....lin. ft.	18,900	3,315	3,835	17.5	20.3
Second-class concrete.....cu. yds.	4,600	1,273	1,512	27.7	32.9
Reinforced concrete.....cu. yds.	285	147	265	51.6	82.3
First-class masonry bridge coping.....cu. yds.	11	0	0	0	0
Third-class stone paving.....sq. yds.	580	0	0	0	0
Third-class riprap.....cu. yds.	105	0	106	0	100.9
Structural steel.....lbs.	550,000	158,073	158,073	28.7	28.7
Metal reinforcement.....lbs.	30,200	15,749	26,645	52.1	88.2
Wooden pavement, 2½-in. thick.....sq. yds.	0	0	0	0	0
Wooden fence.....lin. ft.	3,930	0	0	0	0
Coffer-dam, pumping, bailing and draining lump sum	\$15,500	0	0	0	0
Resetting old fence.....lin. ft.	380	0	0	0	0
Removing old bridge superstructures lump sum	\$1,000	\$420	\$520	42	50
Maintaining highway traffic.....lump sum	\$3,500	\$455	\$1,190	13	34
Raising bridge superstructures.....lump sum	\$3,500	\$315	\$2,240	9	64
Coffer-dam, pumping, bailing and draining of north abutment, Free bridge.....lump sum	\$800	0	0	0	0
Raising north end of north span, Free bridge lump sum	\$400	0	0	0	0
Maintaining highway traffic, north end of Free bridge.....lump sum	\$300	0	0	0	0
Maintaining highway traffic at State ditch bridge.....lump sum	\$1,100	\$250	\$250	25	25
Gross estimate.....	\$127,521	\$25,540	\$40,500	20	31.8

Engineer's estimate, \$107,120; contract price, \$127,521.

Contract No. 22-A.

This contract provides for a new substructure, approach spans and approaches for a bridge over the Erie canal at Weedsport, Sta. 4819 + 60.

The work under this contract became necessary on account of the failure, due to settlement, of the north abutment of the Weedsport highway bridge, which had been completed under contract No. 22.

In the latter part of November, 1911, the north abutment of this bridge began to show signs of settlement, and finally failed so badly as entirely to obstruct traffic and to render the superstructure in danger of entire destruction.

Under an emergency contract, to safeguard the superstructure and to reopen traffic, the services of the John Eichleay, Jr. Co.,

experts in this particular kind of work, were engaged. Timber cribs were constructed, by means of which the superstructure was supported, a temporary approach built and traffic again resumed.

To date only a partial estimate has been paid the contractor for this work, which is shown in the following table:

CONTRACTOR.	Resolution of Canal Board.	Total estimate of work done up to March 20, 1912.	Payment 10 per cent deducted.
John Eichleay Jr. Co.....	Dec. 13, 1911	\$7,000	\$6,300

The settlement of the north abutment and the ground in the immediate vicinity indicated that it was advisable to build the new structure in a new location and to change the design of the substructure by eliminating the heavy concrete slab approaches and substituting light steel spans. Also the abutments were changed to piers.

This contract was awarded to Lupfer & Remick on August 8, 1912. Work has not yet been started on this contract.

Contract No. 5-A.

This contract was awarded to James Stewart & Co. of New York city on January 20, 1912. The length of this contract is 2.44 miles, extending from Sta. 5073, near Mosquito Point bridge over the Seneca river, to Sta. 5202 + 62.89, near Fox Ridge. Included in this contract are concrete substructures for Howland's island and Mosquito Point bridges and a crib retention dam in Owasco creek outlet.

Work was begun on this contract soon after it was awarded and at the end of the fiscal year was 75 per cent completed.

The concrete substructure of Howland's island bridge is completed and that at Mosquito Point is about 60 per cent completed.

The excavation for the retention dam is completed and materials for the dam proper are being delivered on the site. The

prism excavation is practically completed, with the exception of a small amount of hard material, which is yet to be removed.

The following table shows summary of work done during the fiscal year:

ITEMS OF WORK.	Preliminary estimate.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
All excavations..... cu. yds.	202,300	168,032	168,032	83.1	83.1
Sheeting and bracing..... ft. B. M.	3,200	3,000	3,000	93.7	93.7
Lining..... cu. yds.	240	0	0	0	0
Forming embankment..... cu. yds.	7,900	1,068	1,068	13.5	13.5
Sawed lumber, hemlock..... ft. B. M.	61,000	0	0	0	0
Round timber in cribs..... lin. ft.	6,400	0	0	0	0
Stone filling in cribs..... cu. yds.	900	0	0	0	0
Foundation piles..... lin. ft.	5,900	2,320	2,320	39.3	39.3
Wooden sheet-piling..... ft. B. M.	5,000	0	0	0	0
Steel sheet-piling..... sq. ft.	4,700	4,248	4,248	90.4	90.4
Second-class concrete..... cu. yds.	1,380	200	200	14.5	14.5
First-class masonry bridge coping..... cu. yds.	14	0	0	0	0
Second-class riprap..... cu. yds.	1,940	256	256	13.2	13.2
Wooden fence..... lin. ft.	1,486	0	0	0	0
Maintaining traffic..... lump sum	\$550	\$275	\$275	50	50
Coffer-dam, etc..... lump sum	\$2,200	\$1,650	\$1,650	75	75
Supporting highway bridge at Mosquito Point lump sum	\$2,500	\$1,500	\$1,500	60	60
Gross estimate.....	\$317,597	\$239,990	\$239,990	75.6	75.6

Engineer's estimate, \$395,285; contract price, \$317,597.

Contract No. 46.

This contract is for the construction of the Barge canal from Fox Ridge to the southeast corner of the town of Galen, a distance of 9.44 miles. The following structures are included in this contract: bridge at Wayne county line, toll road bridge at Montezuma, lock No. 25 and movable dam at May's Point.

The substructure for the movable dam has been completed.

At lock No. 25 the excavation is completed, foundation piles driven and concrete footing course laid in the southwest approach wall. Fifty per cent of the first-class steel sheet-piling has been driven in the north and south walls of the lock.

The hydraulic dredge has completed the prism between the West Shore railroad crossing and the Rochester, Syracuse and Eastern railroad crossing, and has also worked over an area extending from the West Shore crossing one mile to the north.

BARGE CANAL, CONTRACT NO. 46.
Driving piles to prevent sliding at site of southeast approach wall to lock No. 25, at May's Point.



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The following table shows summary of work done during the past fiscal year:

ITEMS OF WORK.	Preliminary estimate, as affected by alterations Nos. 1, 2 and 3.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Clearing..... lump sum	\$5,000	0	\$2,700	0	54
All excavation..... cu. yds.	5,034,960	515,335	3,825,616	10.2	76
Sheeting and bracing..... ft. B. M.	161,500	0	22,722	0	14.1
Forming embankment..... cu. yds.	71,090	3,595	4,714	5.1	6.8
Lining..... cu. yds.	1,800	0	0	0	0
Sawed lumber, yellow pine or Douglas fir ft. B. M.	11,000	0	0	0	0
White oak lumber in miter-sills and lock-gates ft. B. M.	8,000	0	0	0	0
Foundation piles, 15 to 30 ft. long..... lin. ft.	172,050	14,374	34,762	8.3	20.2
Mooring piles, 20 ft. long..... lin. ft.	20	0	0	0	0
Wooden sheet-piling..... ft. B. M.	188,030	0	151,433	0	80.5
Second-class concrete..... cu. yds.	32,266	990	4,121	3.1	12.8
Reinforced concrete..... cu. yds.	190	0	0	0	0
First-class masonry bridge coping..... cu. yds.	5	0	0	0	0
Second-class riprap..... cu. yds.	3,844	0	1,004	0	26.1
2½-in. wrought iron pipe and specials..... lbs.	250	0	0	0	0
Structural steel..... lbs.	575,722	0	296	0	0.05
Metal reinforcement..... lbs.	32,100	0	1,106	0	3.5
Steel castings..... lbs.	12,800	0	0	0	0
Iron castings, plain..... lbs.	6,600	0	0	0	0
Wood pavement..... sq. yds.	920	0	0	0	0
Wooden fence..... lin. ft.	3,650	0	0	0	0
Wrought iron chain..... lbs.	6,000	0	0	0	0
Sawed lumber in needles..... ft. B. M.	18,000	0	0	0	0
Metal in buffer-beams..... lbs.	96,000	0	0	0	0
Metal in lock-valves..... lbs.	25,000	0	0	0	0
Metal in lock-gates..... lbs.	188,000	0	0	0	0
Pairs of uprights including bracing..... pair	4	0	0	0	0
Gates "A"..... No.	4	0	0	0	0
Gates "B"..... No.	4	0	0	0	0
Cast-iron idlers..... No.	24	0	0	0	0
Bearing shoes..... No.	8	0	8	0	100
Machinery..... lbs.	25,000	0	0	0	0
Coffer-dam, pumping, bailing and draining lump sum	\$12,000	0	\$3,600	0	30
Removal of bridge superstructure..... lump sum	\$200	0	\$150	0	75
Maintaining highway traffic..... lump sum	\$1,500	\$450	\$1,275	30	85
<i>Deductions.</i>					
Removing old buildings..... lump sum	\$250	0	\$150	0	60
Sheeting and bracing reused..... ft. B. M.		0	1,620		
Steel sheet-piling, first-class..... sq. ft.	46,000	21,830	21,830	47.4	47.4
Cutting off steel sheet-piling..... lin. ft.	950	0	0	0	0
Storing steel sheet-piling..... sq. ft.	10,250	0	0	0	0
Steel sheet-piling, second-class..... sq. ft.	1,520	0	0	0	0
Gross estimate.....	\$1,305,930.05	\$128,760	\$734,720	9.9	56.2

Engineer's estimate, \$1,367,533.00; contract price, \$1,305,930.05.

OSWEGO CANAL, RESIDENCY No. 1.

Resident Engineer T. M. Ripley reports:

During the latter month of the fiscal year a field party has been employed making appropriation surveys along Ox creek, a westerly tributary to the Oswego river about four miles south of the city of Fulton. Owing to the fact that this creek has a very flat slope and considerable low ground along its banks, a large

amount of property will be overflowed because of the raising of the upper dam at Fulton. This necessitates the making of appropriations and the law requires that these be made to the maximum navigable stage. Much of the ground being swampy, work has been slow and difficult, and, owing to the appropriations being determined by the said maximum navigable stage, a line of levels had first to be run and points established at frequent intervals, so that the transit line could be determined therefrom. It is hoped to have all of these surveys completed before the coming winter.

Since the beginning of Barge canal construction the work on this residency has been divided as follows:

Contracts Nos. 10, 10-A, 10-B, 33, 39, 53, 78, 80, 85, 90, 90-A, 104, highway adjacent to contract No. 78 and Ox creek highways. For general description of contracts Nos. 10, 33, 39, 53, 78, 80, 85, 90, highway adjacent to contract No. 78 and Ox creek highways, see Annual Report of 1911.

Contract No. 10-A. For completing the construction of the canal and raising the upper dam at Fulton and, practically, all other work originally included under contract No. 10 south of lock No. 2.

Contract No. 10-B. For completing the construction of the canal north of contract No. 10-A, as shown originally under the plans for contract No. 10.

Contract No. 90-A. Power plants, substations and equipment necessary to complete installation on locks Nos. 1, 2, 7 and 8. Oswego canal. Locks Nos. 1 and 2 are on this residency.

Contract No. 104. For constructing a reinforced concrete arch bridge over the Oswego canal at Broadway, Fulton.

The total amount of work done on this residency during the year is shown in the following tables:

Work under Contract Prior to October 1, 1911.

	Value of work under contract.	Value of work done to Oct. 1, 1911.
Contract No. 10.....	\$1,111,964 57	\$668,360 00
Contract No. 33.....	55,020 00	24,890 00
Contract No. 39.....	1,048,674 00	130,600 00
Contract No. 53.....	167,385 00	164,759 27
Contract No. 78.....	49,025 95	46,360 00
Contract No. 80.....	117,390 64	53,030 00
Contract No. 85.....	13,238 50	500 00
Contract No. 90.....	32,719 80	15,950 00
Highway.....	11,627 50	11,090 00
Totals.....	\$2,607,045 96	\$1,115,539 27

Raising the upper dam at Fulton by means of a floating concrete mixer.

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Work under Contract Prior to October 1, 1912.

	Value of work under contract.	Value of work done to October 1, 1912.
Contract No. 10.....	\$1,111,964 57	\$668,360 00 Relet
Contract No. 10-A.....	174,513 90	88,600 00
Contract No. 10-B.....	487,545 00	76,240 00
Contract No. 33.....	24,961 03	24,961 03 Final
Contract No. 39.....	1,048,674 00	230,720 00
Contract No. 53.....	167,535 00	164,575 52 Final
Contract No. 78.....	49,025 95	50,068 19 Final
Contract No. 80.....	117,390 64	110,886 34 Final
Contract No. 85.....	13,173 00	12,010 00
Contract No. 90.....	32,719 80	29,850 00
Contract No. 90-A.....	34,950 05	990 00
Contract No. 104.....	39,370 00	590 00
Highway adjacent to contract No. 78.....	15,419 90	16,733 56 Final
Ox creek highways.....	73,353 50	3,560 00
Totals.....	\$3,390,646 34	\$1,478,134 64

Amount of work put under contract during the fiscal year, \$809,742.45. Amount of work done during year \$362,707.99. Percentage of all work on residency done to date, 43.5 per cent. All values based on contract prices.

Contract No. 10.

Relet as contracts Nos. 10-A and 10-B. There remained to be done, on contract No. 10, \$449,604.57 worth of work under the original prices. Under contracts No. 10-A and No. 10-B this work was relet for \$598,033, an increase of \$148,428.43 or 33 per cent.

Contract No. 10-A.

George C. Hannon, Leveler, in charge. The T. A. Gillespie Co., 50 Church street, New York city, contractors.

Under this contract, as originally let, the upper dam at Fulton was to be raised 5 feet, the prism excavation was to be completed above lock No. 2, the dike for protecting the city of Fulton from overflow during high water to be completed to a connection with the dike built under contract No. 78, three concrete-topped guide piers to be built in the river and snubbing posts, fenders, etc., placed. Three alterations have been made to the plans of this contract since the letting, the only one of moment being alteration No. 3, which requires the placing of six large Taintor gates, each 26 feet 8 inches in the clear, in the dam for the purpose of flood regulation.

The work done consists of 74 per cent of the prism excavation, the completion of the dike, the guide piers and the fixed portion

of the dam (206 feet long), the laying of concrete sills for the Taintor gates and some minor construction.

This contract was let December 14, 1911. Work was started January 11, 1912. The original time limit expired on September 1, 1912. This time was necessarily extended, owing to the large increase of work because of the building of the Taintor gates under alteration No. 3.

The following table gives the summary of work done:

ITEMS OF WORK.	Preliminary estimate, as affected by alterations.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Grubbing..... cu. yds.	1,020	197	197	1.9	1.9
Excavation from spoil bank..... cu. yds.	9,070	1,760	1,760	19.4	19.4
All other excavation..... cu. yds.	38,830	27,993	27,993	72.1	72.1
Forming embankment..... cu. yds.	25,220	21,044	21,044	83.5	83.5
Hemlock, sawed lumber..... ft. B. M.	25,000	18,400	18,400	73.6	73.6
Spruce, sawed lumber..... ft. B. M.	21,500	17,700	17,700	82.3	82.3
White oak, sawed lumber..... ft. B. M.	2,100	800	800	38	38
First-class concrete..... cu. yds.	2,480	1,011	1,011	40.7	40.7
Second-class concrete..... cu. yds.	730	592	592	81	81
Finishing concrete surfaces..... sq. ft.	3,500	3,150	3,150	90	90
Repairing tops, concrete walls..... cu. ft.	250	145	145	58	58
Wash wall..... cu. yds.	1,300	1,181	1,181	91	91
Stone filling..... cu. yds.	400	225	225	56	56
Iron castings, plain..... lbs.	5,300	5,030	5,030	95	95
Structural steel..... lbs.	6,780	5,377	5,377	79	79
1-in. log chain..... lbs.	1,900	2,146	2,146	113	113
30-in. concrete drain..... lin. ft.	25	18	18	72	72
Trenching and backfilling for 30-in. concrete drain..... lin. ft.	25	18	18	72	72
Removing old plant, debris, etc..... lump sum	1	90%	90%	90	90
Metal in Taintor gates..... lbs.	335,700	34	34	.....	.....
Coffer-dams, pumping, bailing and draining..... lump sum	1	50%	50%	50	50

Engineer's estimate, original, \$103,058; plus alterations Nos. 1, 2 and 3, \$67,304.40; total, \$170,362.40.

Contractor's price, original \$106,738; plus alterations Nos. 1, 2 and 3, \$67,775.90; total \$174,513.90.

Total work done during year = 50.8 per cent of contract price.

Total work done to date = 50.8 per cent of contract price.

Contract No. 10-B.

Harry H. Brown, Assistant Engineer, in charge. Oswego Construction Co., G. C. Hodgson, Pres., Fulton, N. Y., contractors.

Under this contract the embankment and spoil west of lock No. 2 is to be placed, the lower end of this lock and the prism excavation and docking wall between this and lock No. 3 to be completed, lock No. 3 to be built (a 27-ft. lift), the prism excavation and docking walls below this lock and the raising of the remainder of the lower dam (about 200 lin. ft.) to be finished, also many minor items of work to be done.

BAROE CANAL, CONTRACT NO. 10-B.
View showing excavation for lock No. 3, at Fulton, between bulkhead No. 1 and head-race already built on the east, and Oswego river and undisturbed power plant on the west.

The excavation for lock No. 3 has been four-fifths completed (about 32,000 yards, mostly rock) and work started on the docking walls above and below this lock.

The contractor purchased the plant on the work and has added about \$50,000 worth of new equipment.

This contract was let March 4, 1912. Work was started April 6, 1912. The time limit expires December 1, 1913.

The following table gives the summary of work done:

ITEMS OF WORK.	Preliminary estimate.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
All excavation.....cu. yds.	88,140	33,555	33,555	38	38
Channeling.....sq. ft.	25,000	6,296	6,296	62	62
Line drilling.....sq. ft.		9,224	9,224		
Forming embankment.....cu. yds.	23,600	470	470	2	2
Second-class concrete.....cu. yds.	35,700	419	419	1.2	1.2
Structural steel.....lbs.	28,100	430	430	1.5	1.5
Metal reinforcement.....lbs.	66,700	2,180	2,180	3.3	3.3

Engineer's estimate, \$515,044; contractor's price, \$491,295.
Total work done during year = 15.5 per cent of contract price.
Total work done to date = 15.5 per cent of contract price.
One alteration, allowing the substitution of close drilling for channeling, has been placed on this contract, but the amount thereof cannot at present be determined.

Contract No. 33 (on Contract No. 10-B).

Owing to the fact that the progress of this contract, which is for lock-gates, valves, needle-beams, etc., was dependent upon work which has not yet been built, no progress has been made thereon on this residency during the year.

The following table shows the status of the work:

Engineer's estimate, entire contract.....	\$183,618 50
Contractor's price, entire contract.....	\$199,639 70
Contractor's price on this residency.....	\$30,918 00
Percentage of work done during year,	00.
Percentage of work done to date,	80.7.

Contract No. 39.

P. H. Budd, Assistant Engineer, in charge. James Stewart & Co., 30 Church street, New York city, contractors.

The dipper dredge and drill boat worked south of Phoenix until December 27, 1911, when the plant was laid up for the winter.

It resumed operations on April 1, 1912, and practically completed the prism excavation between Three River Point and Phoenix, excepting under the highway bridge at the latter place. This excavation was mostly rock, which required blasting.

As the upper dam at Fulton, contract No. 10-A, was not raised until about September 1, 1912, the dredging fleet could not move into and operate in the pool between Fulton and Phoenix between August 1 and September. It was, therefore, transferred to contract No. 12 during this time, but is now being brought into the raised pool *via* the old canal to Hinmansville and the river to the point of beginning near Morsman's lock (old lock No. 7).

The following table gives the summary of work done:

ITEMS OF WORK.	Preliminary estimate.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Excavation.....cu. yds.	1,226,000	120,630	277,983	9.5	22.6

Engineer's estimate, \$972,900; contractor's price, \$1,048,674.
Percentage of work done during year = 9.5 per cent of contract price.
Percentage of work done to date = 22.6 per cent of contract price.

Contract No. 53.

The completion of this contract was noted in last year's report. Totals are shown in the following table:

Engineer's estimate	\$200,500 00
Contractor's price	\$167,585 00
Final estimate	\$164,575 52

This is the amount of the final as returned by residency office.

Contract No. 78.

Mark D. Ewell, Leveler, in charge. Cunningham-Woodard Co., Hudson Falls, N. Y., contractors.

Work on this contract was completed December 31, 1911, and the final estimate sent in.

The work under this contract consisted in raising the tow-path southerly from the south end of old contract No. 10, now contract No. 10-A, for a distance of about 6,300 feet, in order to protect property after the upper dam at Fulton should have been raised. The southerly end of this dike joined the county highway and this latter was also raised for a distance of about 3,300 feet to high ground to the south. This highway work was let and is reported as a separate contract, but the actual dike construction was about 9,600 feet long.

The following table gives the summary of work done:

ITEMS OF WORK.	Preliminary estimate.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Excavation.....cu. yds.	105,550	13,263	117,065	12.5	111.5
Embankment.....cu. yds.	91,430	5,340	94,789	5.8	103.5
Second-class concrete.....cu. yds.	44	0.9	40.9	2	93
Wash wall.....cu. yds.	6,230	171	5,501	2.7	88.3
24-in vitrified pipe, laid.....lin. ft.	750	0	718	0	95.8
10-in. vitrified pipe, laid.....lin. ft.	50	0	40	0	80
Manhole covers and grating.....lbs.	700	0	696	0	99.5
Additional manhole, exclusive of cover, lump sum	\$43	0	\$43	0	100
Trenching and backfilling for 700 ft. of vitrified pipe.....lin. ft.	700	0	665	0	95

Engineer's estimate, original, \$55,151; plus alterations Nos. 2 and 3, \$1,301.45; total \$56,458.45.
Contract price, original, \$47,721.50; plus alterations Nos. 2 and 3, \$1,301.45; total \$49,025.95.
Final estimate, \$50,068.19.
Percentage of work done during year = 7.8.
Percentage of work done to date = 100.

Contract No. 80.

William H. Hilborn, Leveler, in charge of contract. Walter Bradley, Fulton, N. Y., contractor.

This contract consisted of building an ogee dam across the Oswego river at Phoenix, six Taintor gates, each 26 feet 8 inches in the clear, sets of new headgates for the mills on either side of the river and removing the old masonry dam. The new dam is about four feet higher than the old one and additional spillway is secured by building it in the shape of a " V " with the Taintor gates at the apex for the control of floods.

By September 30, 1911, 45 per cent of this contract had been completed and the work was well under way. By February, 1912, practically all work had been finished, excepting the concrete counterweights for the Taintor gates and the removal of a portion of the old dam. It was not considered advisable to place the former in freezing weather and the latter could not be removed, owing to a rising river.

The last monthly estimate was rendered on this work August 1, 1912, and the final sent in, August 8, 1912.

The following table gives the summary of work done:

ITEMS OF WORK.	Preliminary estimate.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Excavation.....cu. yds.	6,930	2,067	5,139	29.8	74.2
Embankment.....cu. yds.	300	49	49	16.3	16.3
Sawed lumber, yellow pine.....ft. B. M.	5,000	3,126	4,206	62.5	84.1
Sawed lumber, white oak.....ft. B. M.	2,800	1,020	2,672	36.4	95.4
Second-class concrete.....cu. yds.	6,484	1,989.5	6,088.5	30.6	93.9
Metal reinforcement.....lbs.	24,100	17,608	23,541	73.1	97.7
Metal in head-gates.....lbs.	189,520	121,606	186,211	64.2	98.2
Metal in valves.....lbs.	4,920	2,662	5,253	54.1	106.7
Metal in Taintor gates.....lbs.	312,200	290,455	294,506	93	94.3
Gate-boists, class "A".....No.	8	5	8	62.5	100
Gate-boists, class "B".....No.	19	19	19	100	100
Removing old steel in bulkheads.....lump sum	1	66%	100%	66	100
Coffer-dams, pumping, bailing and draining.....lump sum	1	34%	100%	34	100

Engineer's estimate, \$134,340.

Contractor's price, \$117,390.64.

Final estimate, \$110,886.34.

Percentage of work done during year = 52 per cent of contract price.

Percentage of work done to date = 100 per cent of contract price.

Contract No. 85.

Wm. H. Hilborn, Leveler, in charge of contract. Lupfer & Remick, Buffalo, N. Y., contractors. This contract is for a lift-bridge over lock No. 1 at Phoenix. A description of the bridge was given in the report for 1911.

Work progressed very slowly on this contract and certain small items have delayed the making of the final estimate. The bridge has been open for traffic and operated by hand during the past five or six months. The work is now completed. There is one more monthly estimate to be rendered and the final estimate will soon be finished.

The following table gives the summary of work done:

ITEMS OF WORK.	Preliminary estimate.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Excavation.....cu. yds.	1,260	252.7	763.7	33	60.5
Embankment.....cu. yds.	630	158	170	93	27
Lining.....cu. yds.	44	47.8	47.8	101.8	101.8
Second-class concrete.....cu. yds.	188	145.6	145.6	77.5	77.5
Structural steel.....cu. yds.	83,500	82,021	82,021	98.4	98.4
Machinery.....cu. yds.	17,700	16,402	16,402	92.8	92.8
Yellow pine, sawed lumber.....ft. B. M.	3,800	3,620	3,620	95.5	95.5
Electrical equipment.....lump sum	1	100%	100%	100	100
Operator's cabin.....lump sum	1	100%	100%	100	100
Safety gate.....lump sum	1	100%	100%	100	100
Coffer-dams, pumping, bailing and draining.....lump sum	1	60%	100%	60	100
Deduct for bridge superstructure....lump sum	1	100%	100%	100	100

Engineer's estimate, \$12,785.50.
Contractors' price, \$13,238.50.
Percentage of work done during year = 87 per cent of contract price.
Percentage of work done to date = 100 per cent of contract price.
Lining increased from 33 to 44 cubic yards by resolution of Canal Board dated January 31, 1912.

Contract No. 90.

In charge of assistant engineers on the primary contracts affected. D'Olier Engineering Co., Philadelphia, Pa., contractors.

The work under this contract, on this residency, has progressed slowly, it being carried on in conjunction with similar work on Oswego canal Residency No. 2 (locks at Oswego) and Erie canal Residency No. 6 (lock at Baldwinsville).

The work has been completed under this contract on this residency in so far as possible to do so — the part remaining being work which cannot be finished because of incompleted structures upon which it is to be placed.

The following table gives the summary of work done:

ITEMS OF WORK.	Preliminary estimate, as affected by alterations.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Excavation.....cu. yds.	71	5	37	7.1	51.9
Chipping concrete.....cu. ft.	9	13	20	145	222
Embankment.....cu. yds.	62	4	23	6.4	37
Second-class concrete.....cu. yds.	14.4	1	11	0.7	76.4
Structural steel.....lbs.	48,724	3,025	43,384	6.2	89
Iron castings, plain.....lbs.	40,200	82	37,609	0.2	93.5
Metal ducts.....lbs.	13,894	1,676	12,425	12	89.5
Concrete conduit, single duct.....lin. ft.	900	11	874	1.2	97.2
Concrete conduit, double duct.....lin. ft.	867	0	592	0	68.3
Reinforced concrete conduit double, duct, lin. ft.	14	0	8	0	57.1

ITEMS OF WORK.	Preliminary estimate, as affected by alterations.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Drilling 1½-in. holes for ducts.....lin. ft.	46	7	70	15.2	152
Drilling 3-in. holes for ducts.....lin. ft.	171.5	13	156	7.6	91
3-in. fiber ducts.....lin. ft.	61	0	23	0	37.7
Lead-covered, rubber-insulated conductors lbs.	17,440	8,234	13,881	47.2	79.5
Electric capstans.....No.	2	2	2	100	100
Miscellaneous electrical equipment.....No.	2	35.5%	99.5%	35.5	99.5
Maintenance accessories.....No.	2	2	2	100	100
Coffer-dams, pumping, bailing and draining, lump sum	\$25	0	0	0	0
Valve-operating machinery.....lbs.	34,500	10,843	31,761	31.4	92
Gate-operating machinery.....lbs.	49,750	23,200	40,516	46.8	81.5
Lamp poles.....No.	20	19	19	95	95
3-hp. motors.....No.	8	5	8	62.5	100
7½-hp. motors.....No.	8	8	8	100	100

Engineer's estimate, entire contract, \$180,630.
Contractor's price, as affected by alterations Nos. 2 and 3, \$180,317.94.
Contractor's price, on this residency, \$32,719.30.
Percentage of work done during year = 48.2.
Percentage of work done to date = 97.
Percentage is based on portion of contract chargeable to this residency.

Contract No. 90-A.

H. A. J. Castor, Engineering Draftsman, in charge. Lupfer & Remick, Buffalo, N. Y., contractors.

The portion of this contract on this residency consists in building and equipping a substation adjacent to lock No. 1 at Phoenix and the construction of a hydro-electric plant at lock No. 2 at Fulton, with the exception of the wheel pits, feed culvert and tail culvert. These latter were put in under contracts Nos. 10 and 10-B.

Work was started on this residency under this contract, August 19, 1912. This work consisted of the extra foundation necessary for carrying the south end of the power-house at lock No. 2.

The following table gives the summary of work done:

ITEMS OF WORK.	Preliminary estimate.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Excavation.....cu. yds.	1,119	219	219	20	20
Chipping concrete.....cu. ft.	63	3	3	4.5	4.5
Second-class concrete.....cu. yds.	137	67	67	49	49

Engineer's estimate, entire contract, \$61,840.
Contractor's price, entire contract, \$61,020.20.
Contractor's price on this residency, \$34,950.05.
Percentage of work done during year = 7.5.
Percentage of work done to date = 7.5.

BARGE CANAL, CONTRACT No. 90.
Building power house at lock No. 2, at Fulton.

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Contract No. 104.

Mark D. Ewell, Leveler, in charge. R. B. Murdock, Crown Point, N. Y., contractor.

This contract is for the building of a 145-foot reinforced concrete arch span over the Barge canal at Broadway in the city of Fulton, which is to form a part of a concrete arch bridge across the river, replacing an old condemned structure. The remaining arches, viz., four 135-foot spans and one 60-foot span, are being built by the county of Oswego and the city of Fulton under a separate contract. The grade of the bridge will be uniform from East First street to West First street and, as the roadway over the westerly arch is about 60 feet above water-surface, the bridge, when finished, will be a bold and handsome structure.

The progress of work on the arch to be built by the state depends entirely upon the progress of work on the remainder of the bridge. At the end of the fiscal year practically nothing had been done on the State's portion, with the exception of building a temporary bridge over the lock and making a connection with the bridge built by the other contractor across the river. The plant used by the contractor for the city, which is installed, will be used by the State's contractor for doing his work.

This contract was let March 5, 1912. Owing to the comparatively small amount of work done, no table of progress is given.

Highway Adjacent to Contract No. 78.

M. D. Ewell, Leveler, in charge. Cunningham-Woodard Co., Hudson Falls, N. Y., contractors.

At the beginning of this fiscal year this work had been 95.4 per cent finished, based on the original estimate. There remained the placing of the guard-rail and the wash wall. During the year the item of "Lining" was added; wash wall was increased from 180 to 400 cu. yds., excavation from 23,000 to 26,520 cu. yds. and embankment from 21,000 to 24,000 cu. yds.

It was stated in the report for 1911 that the material for this work was taken from the same borrow pit as used for contract No. 78. This is true, with the exception of a small amount which was purchased by the contractors from J. W. Tilden at the inter-

section of the highways. The gravel for lining was secured from the same farm and taken from a knoll adjacent to the highway and between Tilden's house and Keller creek.

The following table gives the summary of work done:

ITEMS OF WORK.	Preliminary estimate, as affected by alterations.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Excavation cu. yds.	26,520	3,051	31,745	11.5	120
Embankment cu. yds.	24,000	2,612	26,847	11	112
Guard rail lin. ft.	4,000	4,600	4,600	115	115
Second-class concrete cu. yds.	186	0	133 7	0	71 5
Timber grillage ft. B. M.	10,000	0	12,466	0	124 6
2-inch iron pipe lin. ft.	23	0	23	0	100
Metal reinforcement lbs.	1,200	0	1,530	0	127 4
Clearing lump sum	1	0	100	0	100
Wash wall cu. yds.	400	331	393	98	98
Gravel lining cu. yds.	1,700	1,577	1,577	92	92

Contractor's price, \$11,627 50.

Contractor's price, plus increases, \$15,419 90.

Final estimate, \$16,733 56.

Percentage of work done during year 32.65.

Percentage of work done to date 100.

Ox Creek Highways.

Solomon Reswick, Assistant Engineer, in charge. James Stewart & Co., 30 Church St., New York, N. Y., contractors.

This contract for raising bridges and highways crossing Ox creek consists in the raising of six highways crossing Ox creek and its adjacent low lands and seven small highway bridges. The roads are numbered 1 to 6 from the mouth of the creek and all are roads crossing the creek, with the exception of road No. 2, which connects with road No. 1 at its southerly end and extends a distance of about 1,500 feet, following high ground as much as possible, to an intersection with the present highway.

This contract was let in August, 1912, and work was started at road No. 3, on August 28, 1912.

The following table gives the summary of work done:

ITEMS OF WORK.	Preliminary estimate.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Grubbing cu. yds.	4,400	221	221	5	5
Excavation cu. yds.	55,200	4,396	4,396	7.9	7.9
Embankment cu. yds.	49,200	3,212	3,212	6.5	6.5
Second-class concrete cu. yds.	1,400	22	22	1.6	1.6

Engineer's estimate, \$73,000.
Contractors' price, \$73,353.50.

Percentage of work done during year = 4.86.
Percentage of work done to date = 4.86.

BARGE CANAL. CONTRACT No. 35.
Construction of lock No. 7, at Oswego.

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OSWEGO CANAL, RESIDENCY NO. 2.

Resident Engineer James Burden reports:

Work has been in progress during the year on six contracts.

Contract No. 35.

This contract is for improving the Oswego canal between a point 0.56 of a mile above Utica street bridge and the harbor line north of Bridge street at Oswego, including the construction of locks Nos. 7 and 8, of 14.5 and 11.1 feet lift respectively, and other incidental work. Length of contract, 0.85 mile.

This contract was awarded to the Gilmour-Horton-Allen Co., September 16, 1907. The contract price, including alterations, is \$760,917.20.

The following table shows the percentage of work done on the contract during the year, as well as the percentage of work done to date:

ITEMS OF WORK.	Preliminary estimate, as affected by alterations.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Excavation..... cu. yds.	199,147	46,510	150,418	23.2	75.5
Sheeting and bracing..... ft. B. M.	58,000	0	310	0	0.6
Embankment..... cu. yds.	5,315	1,493	4,072	28	75.5
Puddle..... cu. yds.	490	0	390	0	79.7
Sawed lumber, yellow pine or Douglas fir, ft. B. M.	41,800	5,538	15,079	13.2	36
Sawed lumber, spruce..... ft. B. M.	1,500	607	1,300	40.5	86.6
White oak lumber in miter-sills and gates, ft. B. M.	12,900	600	6,410	4.6	49.9
Sawed lumber, white oak..... ft. B. M.	44,600	6,351	22,013	14.3	49.5
Second-class concrete..... cu. yds.	55,857	17,121	52,126	30.7	93.5
Reinforced concrete..... cu. yds.	1,661	70	1,195	4.2	90.2
Pointing old masonry..... lin. ft.	3,400	0	2,221	0	65
Fourth-class riprap..... cu. yds.	95	0	5	0	5.1
4-inch wrought iron pipe and specials..... lbs.	6,960	0	5,936	0	85.3
5-inch wrought iron pipe and specials..... lbs.	880	0	736	0	83.7
2-inch pipe valves..... No.	2	0	2	0	100
4-inch pipe valves..... No.	8	0	8	0	100
12-inch pipe valves..... No.	2	0	2	0	100
20-inch pipe valves..... No.	2	0	2	0	100
7-inch vacuum gages..... No.	4	0	4	0	100
Structural steel..... lbs.	475,480	71,645	321,467	15.1	67.9
Metal in lock-gates..... lbs.	406,000	181,239	362,666	44.7	89.4
Metal in needle-dams..... lbs.	85,000	32,946	75,927	38.8	89.3
Metal in lock-valves..... lbs.	33,000	31,125	31,125	94.3	94.3
Metal reinforcement..... lbs.	230,240	16,514	178,444	7.1	77.5
Iron castings, plain..... lbs.	52,950	12,900	37,166	24.4	70.3
Iron castings, machined..... lbs.	17,300	2,053	16,141	11.9	93.2
Wood block pavement..... sq. yds.	500	0	439	0	87.8
Fender fastenings..... No.	1,060	454	984	42.8	92.8
Expansion bolts in place..... No.	115	0	55	0	47.8
Scroll railing..... lin. ft.	440	0	396	0	90
Gate hoists, class "B"..... No.	12	4.5	9.5	37.5	79.3
Gate hoists, class "E"..... No.	5	2.75	4.55	55	91

ITEMS OF WORK.	Preliminary estimate, as affected by alterations.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Removing old bridge superstructures.					
Lump sum	\$100	0	\$75	0	75
Raising buildings					
Lump sum	\$000	0	\$000	0	100
Maintaining highway traffic					
Lump sum	\$500	\$125	\$375	25	75
Conduit east of lock No. 8					
Lump sum	\$500	0	\$100	0	80
Removing concrete in bridge abutments.					
Lump sum	\$73.85	\$73.85	\$73.85	100	100

Total of all work done during year 27.2 per cent of estimated cost.
Total of all work done to date 81.2 per cent of estimated cost.

Contract No. 90

Contract No. 90 is for furnishing and installing equipment for operating and lighting locks Nos. 7 and 8 on the Oswego canal and similar work on other residencies.

This contract was awarded to D'Olier Engineering Co., April 12, 1910.

The following table gives the summary of work done on this residency:

ITEMS OF WORK.	Preliminary estimate, as affected by alterations.	Work done during year	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Chipping concrete.....cu. ft.	3	0.80	0.80	26.7	26.7
Structural steel.....lbs.	40,578	3,498	37,397	8.6	92
Iron castings, plain.....lbs.	24,100	20,124	20,124	83.5	83.5
Metal ducts.....lbs.	17,401	8,428	14,271	48.4	82
Reinforced concrete conduit, double duct, lin. ft.	552	0	518	0	94
Drilling 1½-inch holes for ducts.....lin. ft.	75	16	51	0	68.1
Drilling 3-inch holes for ducts.....lin. ft.	157	35	151	22.3	96.3
Lead-covered, rubber-insulated conductors lbs.	14,460	9,214	10,536	63.7	73
Miscellaneous electrical equipment, lock No. 8, lump sum	\$1,932	\$540.77	\$1,831.34	28	94.8
Miscellaneous electrical equipment, lock No. 7, lump sum	\$3,435	\$2,727.38	\$3,232.33	79.4	94.2
Maintenance accessories, Lock No. 7, lump sum	\$30	\$30	\$30	100	100
Maintenance accessories, Lock No. 8, lump sum	\$30	\$30	\$30	100	100
Valve-operating machinery.....lbs.	19,000	14,310	15,375	75.4	81
Gate-operating machinery.....lbs.	49,750	25,469	41,135	51.2	82.5
Lamp poles.....No.	18	6	12	33.3	67
3-hp. motors.....No.	4	4	4	100	100
7½-hp. motors.....No.	8	8	8	100	100

Not included in the above is an extra and unspecified work order, dated February 28, 1912, amounting to \$151.43 which was completed during the year.

BAROE CANAL, CONTRACT NO. 37.

Construction of lock No. 5, at Minetto. View shows method of carrying concrete in two-wheeled buggies on platform above walls and conveying it to place through chutes.



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ferred on April 19, 1911, to Henry P. Burgard. The contract price, including alterations, is \$2,462,608.70.

The following table gives a summary of work done during the year and the total work done to date:

ITEMS OF WORK.	Preliminary estimate, as affected by alterations.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Clearing lump sum	\$1,000	\$40	\$180	4	18
Excavation cu. yds.	974,510	292,473	641,483	30 01	65.83
Sheeting and bracing ft. B. M.	325,000	18,900	18,900	5.8	5.8
Sheeting and bracing, (used again) ft. B. M.		42,500	42,500		
Forming embankment cu. yds.	16,600	11,402	11,402	68.7	68.7
Second-class concrete cu. yds.	88,240	2,018	2,018	2.3	2.3
Structural steel lbs.	448,190	1,121	1,121	0.2	0.2
Metal reinforcement lbs.	113,480	9,705	9,705	8.5	8.5
Iron castings, plain lbs.	25,920	808	808	3.1	3.1
Iron castings, machined lbs.	51,900	466	466	0.9	0.9
Drilling bolt holes in rock lin. ft.	4,070	588	588	14.4	14.4
Coffer-dams, pumping, bailing and draining, lump sum	\$43,510	\$1,094.40	\$1,094.40	2.5	2.5
Maintaining navigation lump sum	\$500	0	\$125.00	0	25
Removing buildings No.	20	1.5	1.5	7.5	7.5
Removal of bridge superstructure lump sum	\$300	0	\$300	0	100
6-in. vitrified pipe and specials lin. ft.	200	102	102	51	51
18-in vitrified pipe and specials lin. ft.	2,200	2,012	2,012	91	91

Total of all work done during year = 21.5 per cent of estimated cost.
Total of all work done to date = 46.2 per cent of estimated cost.

Road "A," adjacent to Contract No. 37.

This contract is for constructing a highway at the west end of dam No. 6, made necessary by the canal improvement. Length, about 1,400 feet.

The contract was awarded to H. P. Burgard, January 3, 1912. The contract price is \$4,629.

The following table gives a summary of the work done during the year and the total work done to date:

ITEMS OF WORK.	Preliminary estimate.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Excavation cu. yds.	400	19	19	4.75	4.75
Forming embankment cu. yds.	6,900	1,049	1,049	23.9	23.9
Second-class concrete cu. yds.	35	17	17	48.5	48.5
Metal reinforcement lbs.	300	143	143	47.7	47.7
15-in. vitrified pipe and specials lin. ft.	360	319	319	88.6	88.6

Total of all work done during year = 14.7 per cent of estimated cost.
Total of all work done to date = 14.7 per cent of estimated cost.

BARGE CANAL, CONTRACT NO. 37.
Dike to protect low land in Minnetto, after raising of dam.

U.S.

2020

Road "B," adjacent to Contract No. 37.

This contract is for constructing a highway through and to the south of Minetto, made necessary by the construction of the canal improvement. Length 5,960 feet, approximately.

This contract was awarded to H. P. Burgard, January 3, 1912. The contract price is \$93,019.50.

The following table gives a summary of the work done during the year and the total work done to date:

ITEMS OF WORK.	Preliminary estimate.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Clearing.....lump sum	\$100	\$95	\$95	95	95
Excavation.....cu. yds.	41,000	35,576	35,576	86.8	86.8
Forming embankment.....cu. yds.	32,500	29,000	29,000	89.3	89.3
Lining.....cu. yds.	1,610	1,635	1,635	101.6	101.6
Second-class concrete.....cu. yds.	100	102	102	102	102
Metal reinforcement.....lbs.	1,300	1,037	1,037	80	80

Total of all work done during year = 75.6 per cent of estimated cost.
Total of all work done to date = 75.6 per cent of estimated cost.

Contract No. 90-A.

This contract is for the furnishing and equipment of a hydro-electric power plant at lock No. 7, electric capstans at locks Nos. 7 and 8 and transmission lines, arc light poles and arc lights between lock No. 8 and the power plant at lock No. 7 and similar work on Residency No. 1, Oswego canal.

This contract was awarded to Lupfer & Remick, August 8, 1912, for \$64,020.20.

Only preliminary work has yet been done.

WATER-SUPPLY RESIDENCY.

Resident Engineer L. C. Hulburd reports:

This residency has comprised the work of providing the additional water-supply required by the Barge canal for the "Rome summit level." The sources of supply selected for immediate development are the Mohawk river, West Canada creek and Nine-Mile creek. The projects consist of reservoirs for impounding the flood flow of the Mohawk river and the West Canada creek, controlling works for regulating the flow out of the reservoirs and

a diverting channel which will carry a portion of the flow of the West Canada creek to Nine-Mile creek and thence into the summit level. The main features of these projects are embraced in three contracts, Nos. 50, 51 and 55. On July 12, 1912, the residency was divided, the reservoir development on West Canada creek (contract No. 50) being placed in charge of H. J. Morrison, Resident Engineer, with headquarters at Hinckley.

Contract No. 50.

This contract is for constructing a reservoir and dam on the West Canada creek and performing all other work appertaining to the contract. George H. Briggs, Assistant Engineer, has had charge of the engineering corps assigned to this contract.

Under his supervision appropriation maps have been prepared for the balance of the lands required, detail plans have been prepared for new highways to replace those intercepted by the dam and the marking of the perimeter of the reservoir site with concrete monuments has been completed.

This contract was awarded to the Buffalo Dredging Company on September 23, 1910, and construction began the following November. During the past year construction work was suspended in December and resumed in April. Previous to the date upon which Mr. Morrison was placed in charge the contractors had devoted most of their efforts to the portion of the dam south of the spillway. The construction of the core wall had been continued until about 2,350 lin. ft. had been built to an elevation of approximately 1,210; the foundation for the south abutment and gate chamber had been placed; the 42-inch cast iron pipes laid; foundation placed for wings of north abutment; some material, excavated from an area west of the south end of dam, had been deposited within the embankment lines, and coffer-dams had been constructed for unwatering a portion of the creek bed.

Contract No. 51.

This contract is for constructing a canal feeder between Trenton Falls and Nine-Mile creek, together with a gate house, culverts and all other work appertaining to the contract. J. B. Whipple

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BARGE CANAL, CONTRACT NO. 55.
Completed Delta dam — 1,100 feet long. 100 feet high above lowest foundation, forming reservoir two miles across at its greatest width and four miles long.

1000

and H. A. Gehring, Assistant Engineers, have had charge of the engineering corps assigned to this contract.

The work to be done under this contract consists in excavating a ditch 5.7 miles long, with a grade of 1.45 feet per mile and a cross-sectional area of about 150 sq. ft. in the bottom seven feet of depth; also in constructing eight highway crossings, a siphon for carrying the flow under Cincinnatus creek, a concrete flume for passing the water down the steep bank into Nine-Mile creek, a gate house with controlling works, and minor structures, such as culverts, drainage ditches, etc.

The contract was awarded to Geo. T. Cunningham on December 23, 1910, and was later assigned to the Alto Construction Company. Construction began in February, 1911, and has been continued to date. The surface cut along the feeder prism has been made for about 85 per cent of the total length and the excavation has been made approximately to grade for about 60 per cent of the total length. The concrete flume, three highway crossings and two drainage culverts have been completed.

The following table, including alterations and increases as authorized by the Canal Board, shows the progress of construction to date:

ITEMS OF WORK.	Preliminary estimate, as affected by alterations.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Clearing..... lump sum	1	16%	86%	16	86
Excavation..... cu. yds.	531,880	165,865	281,478	31.2	52.9
Sheeting and bracing..... ft. B. M.	112,000	7,162	7,767	6.4	6.9
Forming embankment..... cu. yds.	84,765	6,166	7,666	7.3	9
Lining..... cu. yds.	800	239	239	29.9	29.9
Foundation piles..... lin. ft.	6,500	0	340	0	5.2
Wooden sheet-piling..... ft. B. M.	20,000	0	3,665	0	18.3
Second-class concrete..... cu. yds.	3,550	839	962	23.6	27.1
Second-class reinforced concrete..... cu. yds.	960	480	487	50	50.7
Second-class riprap..... cu. yds.	1,140	148	148	13	13
Cast iron pipe..... lbs.	56,400	10,238	10,238	18.2	18.2
Metal reinforcement..... lbs.	36,400	9,929	10,014	27.3	27.5
Wrought iron pipe railing..... lin. ft.	330	166	166	50.3	50.3
Coffer-dam, pumping, bailing, etc.... lump sum	1	11%	16%	11	16
Maintaining highway traffic..... lump sum	1	11%	16%	11	16
Removing buildings..... No.	6	1	1	16.7	16.7
Office building..... No.	1	0	1	0	100
Gross estimate.....	\$397,931	\$92,980	\$149,630	23.4	37.7
Extra or unspecified work orders, dated Aug. 9, 1912.....	\$816	\$816	\$816	100	100

Contract No. 55.

This contract is for constructing a reservoir dam on the Mohawk river, relocating a portion of the Black River canal, building four locks and performing all other work appertaining to the contract. Chas. W. Costello, Assistant Engineer, has had charge of the engineering corps assigned to this contract.

The contract was awarded to Arthur McMullen on October 19, 1908, and construction work was commenced soon after and continued, excepting short suspensions during the coldest weather, until its completion on August 3, 1912.

The following table, including alterations and increases as authorized by the Canal Board, shows the progress of the construction and a comparison of the final and preliminary estimate quantities:

ITEMS OF WORK.	Preliminary estimate, as affected by alterations.	Work done during year.	Total work done to date. (final estimate).	Per cent of work done during year.	Per cent (final estimate) of contract quantities.
Clearing..... lump sum	1	10%	100%	10	100
Grubbing..... cu. yds.	6,600	329	5,602	5	84.9
Excavation..... cu. yds.	357,350	38,262	361,967	10.7	101.3
Sheeting and bracing..... ft. B. M.	73,000	4,249	55,639	5.8	76.2
Channeling..... sq. ft.	25,200	0	7,229	0	28.7
Forming embankment..... cu. yds.	161,880	8,461	120,690	5.2	74.6
Lining..... cu. yds.	472	96	371	20.3	78.6
Puddle..... cu. yds.	820	144	754	17.6	92
Sawed lumber..... ft. B. M.	27,200	2,021	24,031	7.4	88.3
Round timber bracing..... lin. ft.	1,000	44	461	4.4	46.1
Foundation piles..... lin. ft.	820	0	779	0	95
Second-class concrete..... cu. yds.	21,890	739	21,408	3.4	97.8
Reinforced concrete..... cu. yds.	949	52	756	5.5	79.7
Cyclopean masonry..... cu. yds.	85,400	5,066	76,543	5.9	89.6
Slope wall, in mortar..... cu. yds.	80	24	78	30	97.5
Slope wall, dry..... cu. yds.	80	20	73	25	91.2
Wash wall..... cu. yds.	340	59	254	17.4	74.7
24-inch stone paving..... sq. yds.	1,870	1,178	1,937	63	103.6
First-class stone paving..... sq. yds.	640	108	627	16.9	98
Second-class stone paving..... sq. yds.	1,189	23	1,141	1.9	96
Cobblestone paving..... sq. yds.	180	126	126	70	70
First-class riprap..... cu. yds.	60	4	56	6.7	93.3
Second-class riprap..... cu. yds.	80	0	74	0	92.5
Third-class riprap..... cu. yds.	1,216	895	1,095	73.6	90
Fourth-class riprap..... cu. yds.	330	112	289	33.9	87.6
Cast iron pipe and specials..... lbs.	595,000	294,360	585,632	49.5	98.4
Structural steel..... lbs.	80,860	1,879	57,928	2.3	71.6
Metal reinforcement..... lbs.	55,440	4,099	70,208	7.4	126.6
Wrought iron..... lbs.	6,960	2,252	10,127	32.4	145.5
Steel castings..... lbs.	40	0	25	0	62.5
Iron castings, plain..... lbs.	34,970	2,481	21,872	7.1	62.5
Iron castings, machined..... lbs.	113,200	33,652	126,187	29.7	111.5
Bronze cast ngs..... lbs.	920	0	1,026	0	111.5
Metal in lock-valves..... lbs.	5,700	0	5,402	0	94.8
Wooden fence..... lin. ft.	2,300	1,002	2,080	43.6	90.4
Wrought iron pipe railing..... lin. ft.	1,780	555	1,800	31.2	101.1
Drilling bolt holes in rock..... lin. ft.	900	1	555	0.1	61.7
Capstans..... No.	2	0	2	0	100
Superstructure, upper gate house..... lump sum	1	46%	100%	46	100
Sluice-gate apparatus, valves, etc..... lump sum	1	2%	100%	2	100
Coffer-dam, pumping, bailing, etc..... lump sum	1	31%	100%	31	100.
Raising and moving highway river bridge, lump sum	1	100%	100%	100	100

Completed dam at Delta reservoir discharging water through its gates; also sight of locks for the relocated Black River canal.

ITEMS OF WORK.	Preliminary estimate, as affected by alterations.	Work done during year.	Total work done to date. (final estimate).	Per cent of work done during year.	Per cent (final estimate) of contract quantities.
Maintaining highway traffic..... lump sum	1	100%	100%	100	100
Maintaining navigation..... lump sum	1	100%	100%	100	100
Lead joint strips..... lbs.	1,000	0	1,001	0	100.1
24-inch valves..... No.	2	2	2	100	100
Deduct for bridge superstructure.... lump sum	\$65	.....	65	.....	100
Deduct for buildings in place..... lump sum	\$14,725	.....	\$14,725	.....	100
Gross estimate.....	\$945,839.55	\$66,972.86	\$882,772.86	7.1	93.3
<i>Extra or Unspecified Work Orders.</i>					
Dated Dec. 29, 1910.....	\$427.84	0.00	\$405.30	0	94.7
Dated Jan. 12, 1912.....	707.42	\$706.12	706.12	100	99.8
Dated May 20, 1912.....	400.00	362.69	362.69	100	90.7
Dated July 29, 1912.....	130.00	130.20	130.20	100	100.1
Dated July 30, 1912.....	58.65	58.65	58.65	100	100
Dated Aug. 28, 1912.....	375.00	374.57	374.57	100	99.9

Contract No. 55-R.

This contract is for the removal of bodies from cemeteries located within the limits of contract No. 55, Delta reservoir, to a new cemetery located without the flow line. Chas. W. Costello, Assistant Engineer, has had charge of the engineering corps assigned to this contract.

The contract was awarded to Joseph Kalk and Alfred S. Brown on November 3, 1911. The removal and interment of the bodies began immediately and was completed before the end of the month, the balance of the work in connection with the contract being done during the early part of the past summer.

The following table, including alterations and increases as authorized by the Canal Board, shows the progress of the construction and a comparison of the final and preliminary estimate quantities:

ITEMS OF WORK.	Preliminary estimate, as affected by alterations.	Work done during year.	Total work done to date (final estimate).	Per cent of work done during year.	Per cent (final estimate) of contract quantities.
Boxes..... No.	694	694	694	100	100
Bodies to be exhumed, transported and reinterred..... No.	694	694	694	100	100
Taking up, transporting and resetting tablets or markers..... No.	293	293	293	100	100
Furnishing, painting, numbering and setting new markers..... No.	500	500	500	100	100
Fence, including gates, posts, etc..... lin. ft.	1,285	1,241	1,241	100	96.6
Gross estimate.....	\$7,560.69	\$7,526.25	\$7,526.25	100	99.5
Extra or unspecified work order, dated July 10, 1912.....	\$127.40	\$101.28	\$101.28	100	79.5

Highways Adjacent to Delta Reservoir.

The new highways made necessary by the filling of the Delta reservoir have been constructed under contract entitled "Construction of certain highways adjacent to the Delta reservoir, Oneida county, N. Y." A. G. Card, Assistant Engineer, and C. V. O'Malley, Rodman, have had charge of the engineering corps assigned to the contract.

The contract was awarded to the Cunningham-Woodard Company on March 28, 1911. Construction was commenced during the following month and completed June 12, 1912.

The following table, including alterations and increases as authorized by the Canal Board, shows the progress of the construction and a comparison of the final and preliminary quantities:

ITEMS OF WORK.	Preliminary estimate, as affected by alterations.	Work done during year.	Total work done to date (final estimate).	Per cent of work done during year.	Per cent (final estimate) of contract quantities.
Clearing.....lump sum	1	0	100	0	100
All excavation.....cu. yds.	58,040	19,851	57,559	34.2	99.2
Forming embankment.....cu. yds.	44,800	13,497	44,424	30.1	99.2
Second-class concrete.....cu. yds.	410	146	399	35.6	97.3
Metal reinforcement.....lbs.	7,660	1,731	6,853	22.6	89.5
Cobblestone paving.....sq. yds.	1,110	673	998	60.6	89.9
Fourth-class riprap.....cu. yds.	300	287	287	95.7	95.7
Wooden fence.....lin. ft.	10,500	6,181	9,068	58.8	86.4
4-in. vitrified pipe underdrain.....lin. ft.	740	798	798	107.8	107.8
Yellow pine, sawed lumber.....ft. B. M.	12,000	11,000	11,000	91.7	91.7
Taking down, moving, reerecting, cleaning and painting bridge.....lump sum	1	100%	100%	100	100
Lining.....cu. yds.	1,700	1,694	1,694	99.7	99.7
Gross estimate.....	\$46,386.80	\$19,624.70	\$45,314.70	42.4	97.7

WATER-SUPPLY RESIDENCY.

Resident Engineer Harry J. Morrison reports:

Contract No. 50.

This contract provides for the construction of the Hinckley dam and reservoir on West Canada creek.

The embankment portion of the dam is divided into a north and south portion by a masonry section about 500 feet long, comprising a spillway 400 feet long, with an abutment and gate house at each end.

The crest of the spillway when completed will be at elevation 1,225, the embankment portion at elevation 1,242, and the gate

BARGE CANAL, CONTRACT No. 50.

View of the Hinckley reservoir dam, showing concrete core wall and part of the earth embankment.

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house sections at elevation 1,240. The total length of the dam is approximately 3,600 feet.

Portions of the north and south abutments have been commenced. At the north gate house the masonry has been laid to elevation 1,165 and the laying of the four 60-inch discharge pipes begun. At the south gate house the inlet channel has been excavated and the two 42-inch pipes and gates are concreted in place and the masonry brought to elevation 1,174. For 55 feet at the north end of the spillway, the foundations have been prepared and the masonry completed to elevation 1,165.

Practically nothing has been done on the core wall and embankment north of the masonry section. South of the masonry section the core wall for a length of 2,300 feet of a probable total length of 2,600 feet has been laid to an average elevation of 1,210. The embankment of the southerly portion, including the third-class riprap on the upstream face, is at an average elevation of 1,200.

No construction work has been done upon the relocated highways.

Geo. H. Briggs, Assistant Engineer, is in charge.

The following summary shows the amount of work put under contract and the amount done to September 30, 1912, including alterations in force.

ITEMS OF WORK.	Preliminary estimate, as affected by alterations.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Clearing..... lump sum	\$20,500	0.6%	7.6%	0.6	7.6
Excavation..... cu. yds.	137,700	36,620	78,702	26.6	57.2
Sheeting and bracing..... ft. B. M.	420,000	65,236	213,475	15.5	50.8
Embankment..... cu. yds.	611,210	72,094	115,788	11.8	18.9
Lining..... cu. yds.	7,430	941	941	12.7	12.7
Second-class concrete..... cu. yds.	8,910	1,325	1,325	14.9	14.9
Third-class concrete..... cu. yds.	37,060	13,219	20,336	35.6	54.8
Cyclopean masonry..... cu. yds.	63,910	4,014	4,014	6.3	6.3
Third-class riprap..... cu. yds.	20,440	2,339	2,339	11.4	11.4
Fourth-class riprap..... cu. yds.	2,475	142	142	5.7	5.7
Cast iron pipe and specials..... lbs.	536,000	296,714	296,714	55.4	55.4
Metal reinforcement..... lbs.	34,235	4,770	4,770	13.9	13.9
Iron castings, plain..... lbs.	41,000	3,540	3,540	8.6	8.6
Drilling bolt-holes..... lin. ft.	1,780	102	102	5.7	5.7
Sluice gates, etc., for south gate chamber lump sum	\$3,000	48%	48%	48	48
Coffer-dams, pumping, bailing and draining lump sum	\$18,000	9.3%	14.8%	9.3	14.8
Maintaining highway traffic..... lump sum	\$500	0%	50%	0	50
Line drilling (alteration No. 3)..... sq. ft.	46,000	25,037	25,037	54.4	54.4
Gross estimate.....	\$971,768	\$157,670	\$233,890	16.2	24.1

CAYUGA AND SENECA CANAL, RESIDENCY No. 1.

Resident Engineer L. S. Hulburd reports:

This residency extends from the junction of the Cayuga and Seneca canal with the Erie canal near the Montezuma aqueduct to the upper locks at Seneca Falls and includes the following contracts:

Contract A. For constructing lock No. 1 and dam No. 1 near Cayuga.

Contract H. For excavating a channel in Cayuga lake at Ithaca from a point about 300 feet north of Cascadilla street to deep water in Cayuga lake.

Contract B. For excavating a channel mainly in the Seneca river from Montezuma to deep water in Cayuga lake from Cayuga lake to Seneca Falls. The section of this contract from Waterloo to deep water in Seneca lake has been put under the Waterloo residency.

The remainder of the work on this residency has not been let, but will probably be divided as follows:

Contract C, which will provide for the construction of locks Nos. 2 and 3, dam No. 2, retaining walls, bridge abutments and appertaining work at Seneca Falls.

Contract D, which will include the dredging of a channel from a point one-half mile east of Demont's bridge to Seneca Falls within the limits of this residency.

Surveys.

During the year the original scheme for the canal through Seneca Falls has been changed so that the present canal level above Seneca Falls is to be carried to a point below lock No. 6, where a high dam and two tandem locks are to be built. Because of this change numerous surveys were made during the year, to include the property to be affected by the proposed reservoir. Three calyx drill borings were made at the dam site to a depth of 57 to 67 feet below the surface and a large number of wash drill and drive rod soundings were taken.

Current-meter readings in the river were taken at frequent intervals throughout the year, to check the weir measurement below Seneca Falls. Weekly readings of gages located above and below

the water powers were continued throughout the year and also readings twice a day of three permanent gages along the river.

Contract A.

R. W. Cady, Assistant Engineer, in charge. Scott Bros., of Rome, contractors.

The work on contract A has continued throughout the year. The excavation for the east wall and lock chamber was completed and the east wall and floor of the lock were built, completing nearly all of the concrete work in the main part of the lock. Nearly 200 feet of the northeast approach wall has been completed and the foundation course laid for the remainder.

At the dam site a coffer-dam has been built to include the two eastern piers and abutment and the pile foundation and concrete work has been completed for these two piers and abutment.

The following table, including alterations to date, shows the progress of construction:

ITEMS OF WORK.	Preliminary estimate, as affected by alterations.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Clearing.....lump sum	1	0	0	0	0
Excavation.....cu. yds.	72,480	34,516	45,976	47.6	63.4
Excavation (borrow pit).....cu. yds.	12,000	0	0	0	0
First-quality sheeting and bracing....ft. B. M.	122,000	3,520	104,016	2.8	85.2
Second-quality sheeting and bracing..ft. B. M.	147,000	56,760	90,489	38.0	61.5
Forming embankment.....cu. yds.	10,920	0	0	0	0
Sawed lumber.....ft. B. M.	22,000	0	0	0	0
White oak lumber in miter-sills.....ft. B. M.	8,000	1,265	1,265	15.8	15.8
Foundation piles.....lin. ft.	31,400	8,454	8,454	26.9	26.9
Wooden sheet-piling.....ft. B. M.	121,500	42,642	42,642	35	35
First-quality steel piling.....sq. ft.	23,300	0	22,758	0	97.6
Second-quality steel piling.....sq. ft.	50,200	22,935	22,935	45.6	45.6
Second-class concrete.....cu. yds.	23,400	10,230	15,221	43.7	65
Second-class riprap.....cu. yds.	1,580	172	172	10.8	10.8
Wrought iron pipe and specials.....lbs.	4,000	0	0	0	0
Structural steel.....lbs.	11,400	7,648	8,509	67	74.6
Metal reinforcement.....lbs.	40,900	5,902	7,421	14.4	18.1
Iron castings, plain.....lbs.	7,000	107	1,460	1.5	20.8
Iron castings, machined.....lbs.	7,400	3,247	6,461	43.8	87.3
Metal in lock-gates.....lbs.	196,000	10,141	12,016	5.1	6.1
Metal in buffer-beams.....lbs.	93,000	8,046	8,046	8.6	8.6
Metal in lock-valves.....lbs.	24,000	0	0	0	0
Metal in Taintor gates.....lbs.	325,800	0	0	0	0
Removing buildings.....No.	3	0	0	0	0
Coffer-dam, pumping, bailing and draining lump sum	1	40.7%	49.4%	40.7	49.4
Storehouse.....No.	1	0	0	0	0
Maintaining navigation.....lump sum	1	0	0	0	0
Excavation and embankment outside of sheeting and bracing in lieu of sheeting and bracing.....lump sum	1	92%	92%	92	92
Sawed lumber, hemlock.....ft. B. M.	80,000	0	0	0	0
Stone filling in cribs.....cu. yds.	980	0	0	0	0
Coffer-dams, pumping, bailing and draining, alteration No. 2.....lump sum	1	0	0	0	0

Contract B.

B. I. Hall, Assistant Engineer, in charge. Crowell-Sherman-Stalter Co. of Cleveland, Ohio, contractors.

The dredge *Clyde* has continued working down the river from Mud lock and on September 30 had reached a point within a thousand feet of the north limit of the contract, having completed the full cut for a large part of this distance.

A change in the line was brought about by alteration No. 1, making the center line a tangent line from a point near Free bridge to the curves at the north end of the contract. This required additional property surveys and a relocation of the center line.

The dredge was shut down for repairs and because of cold weather from January 14 to April 4, and during the year worked 250 days, removing 1,862,506 cu. yds. of material, or an average of 7,450 cu. yds. per day for 250 days.

To maintain the level of Cayuga lake, a second dam made of stone filled cribs was built above the first one near the Free bridge road. This dam has kept the lake from getting below elevation 381.5 during the past season.

The following table, including alterations to date, shows the progress of construction:

ITEMS OF WORK.	Preliminary estimate, as affected by alterations.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Clearing..... lump sum	1	7%	7%	7	7
Excavation..... cu. yds.	6,463,050	1,862,506	3,526,784	28.8	54.5
Excavating old masonry..... cu. yds.	1,250	0	0	0	0
First-quality sheeting and bracing.... ft. B. M.	0	0	0	0	0
Second-quality sheeting and bracing... ft. B. M.	0	0	0	0	0
Forming embankment..... cu. yds.	1,000	0	0	0	0
Foundation piles..... lin. ft.	5,140	0	0	0	0
Wooden sheet-piling..... ft. B. M.	0	0	0	0	0
Second-class concrete..... cu. yds.	1,530	0	0	0	0
Wash wall..... cu. yds.	1,000	0	0	0	0
Second-class riprap..... cu. yds.	2,000	0	0	0	0
Third-class riprap..... cu. yds.	0	0	0	0	0
Fourth-class riprap..... cu. yds.	1,150	0	0	0	0
Bailing and draining..... lin. ft. of wall	600	0	0	0	0
Maintaining navigation..... seasons	3	0	0	0	0
Maintaining highway traffic..... lump sum	1	4%	4%	4	4
Deduct for metal in guard-gates ... lump sum	1	0	0	0	0

Contract H.

L. L. Hadley, Assistant Engineer, in charge.

The surveys and plans for this contract were made between October 12 and November 29, 1911, and the contract was let to James H. Dawes of Philadelphia on December 22, 1911. On June 12 the contract was transferred to the New York State Dredging Corporation of Rochester, N. Y.

In February 1912, the contractors began constructing a hull for a 20-inch suction dredge and after its completion the machinery from another dredge was installed. On October 1 the dredge is nearly ready for operating.

No estimate has yet been given on this contract.

CAYUGA AND SENECA CANAL, RESIDENCY No. 2.

Resident Engineer A. E. Steere reports:

This residency extends from a point near Seneca Falls to deep water in Seneca lake near Geneva and from deep water in Seneca lake at Watkins to Ayers street, Montour Falls, and comprises contract I and parts of contracts B, C and D.

Contract B.

The Crowell-Sherman-Stalter Co., contractors.

The portion of contract B within the limits of this residency extends from a point near Waterloo to deep water in Seneca lake near Geneva, a distance of about five miles.

Appropriation surveys and maps for this portion of the contract have been completed and about 156 acres of land have been appropriated for construction purposes. The off-set center line has been staked out in the field and concrete monuments set at points on the line. The right of way appropriated by the State has been marked by concrete monuments at the angle points.

The work done by the contractor has been confined to sinking several test pits to ascertain the class of material to be encountered.

Contract C.

The portion of the contract included in this residency comprises the construction of a lock and its approach walls and a dam in the village of Waterloo.

Plans are in progress at Albany.

Appropriation surveys for this portion of the contract have been completed and the appropriation maps are in progress.

Contract D.

The portion of the contract in this residency consists in excavating a channel mainly in the Seneca river from a point near Seneca Falls to the easterly end of contract C, at Waterloo, and from the west end of contract C to contract B, Sta. 6449.

Plans are in progress at Albany.

The appropriation surveys for the westerly end of this contract in the village of Waterloo have been made.

Contract I.

This contract consists in excavating a channel from deep water in Seneca lake at Watkins to Ayers street, Montour Falls, a distance of 2.75 miles.

This contract was let to the Central Dredging Co. of Cleveland, Ohio, during September, 1912, for \$215,639; Engineer's estimate, \$304,330.

The preliminary surveys, plans and estimate for this contract were made during the fall of 1911 and the early part of 1912.

The appropriation surveys are now in progress with E. S. Overbaugh, Leveler, in charge.

A car load of contractor's plant arrived on the siding at Watkins on September 24, 1912, but has not been unloaded.

The appropriation maps for this contract are in progress and searches for titles are being made in the County Clerk's office.

Black River Survey.

Resident Engineer Louis A. Burns reports:

The work was started August 1, 1911. Topographic surveys were made of all feasible routes and the underlying material was determined. From this information, maps were plotted and comparative estimates were made of numerous projected lines. The most desirable of these lines were then combined into routes. From the data made available by Barge canal experience, the costs

of the necessary structures were estimated. The routes were first compared, considering only economy, leaving the other features to be later investigated.

In regard to the size of the canal, three different propositions were considered and an estimate made of the cost of each. These were briefly as follows: Full-sized Barge canal prism and locks throughout; full-sized prism with locks 188 ft. by 28 ft.; full-sized prism and locks from Lake Ontario to Watertown, using the same prism with the smaller locks for the remaining distance.

For convenience in comparing the routes, the entire canal extension from Carthage to Lake Ontario was divided into three sections, as follows: Carthage to Watertown; in and around Watertown, and Watertown to Lake Ontario.

From Carthage to Watertown's eastern limits there is practically but one way and that is to canalize the river. In and around Watertown there are three principal routes. One follows the river through the city, another passes through the southerly portion, and still another keeps on the north side. From Watertown to Lake Ontario, four routes were considered. The first follows the river practically all the way. The second leaves the river channel about one-half mile above the village of Glen Park, and after by-passing certain gorges, reënters the river at Brownville basin, to continue there until the lake is reached. The third route leaves the river at the same point as the second, running thence nearly parallel to the river until an arm of the lake, known as Muskalonge bay, is reached. The fourth route is entirely an artificial channel. Starting from the westerly limits of the city of Watertown, it follows the course of an abandoned hydraulic canal, known as "Camp's Ditch," and enters Lake Ontario at Sacketts Harbor.

After carefully considering the above-mentioned routes, the following was recommended:

"Beginning at the point where the line between the counties of Jefferson and Lewis intersects the Black river, which point is the most easterly corner of the town of Champion and about three-fourths of a mile upstream from the State dam in the village of Carthage; thence down the Black river with the necessary cutting through bends to a point just above the city limits of Watertown; thence through the northerly portion of the city of Watertown over to and down the valley of Cowan's creek; thence down this valley to the Black river near the Jefferson county fair grounds; thence down the Black river to a point one-half of a mile upstream from the village of Glen Park;

thence over to and down the valley of Muskalonge creek to Muskalonge bay; thence across Muskalonge bay to deep water in Black river bay at Storr's point; thence through Black River bay to Sacketts Harbor on Lake Ontario."

To follow the course of the river in the city of Watertown would involve many damage claims, as well as much difficult construction. To pass through the southern portion would place the canal in a residential district. This would be both inconvenient for shippers and objectionable to contiguous property owners. On the north side location the canal is placed within the manufacturing districts at the eastern and western sections of the city. On this line docks can easily be built at these points, as well as at the railway freight terminal.

In going from Watertown to Sacketts Harbor the canalizing of the river between Watertown and Dexter is an expensive and difficult matter. Construction would be heavy and many damage claims would result. It is doubtful whether a permanent channel could be maintained through the extensive bar which now obstructs the mouth of the Black river.

By leaving the river before encountering the first gorge and crossing over to the valley of Muskalonge creek, no unusual damages or construction would be necessary. An additional advantage of this route is that it would be possible to locate a permanent harbor in Muskalonge bay, which is a sheltered cove of Black River bay.

The matter of supplying water for operating the canal without lessening the present minimum flow of Black river was thoroughly investigated. Much study was given to the problem of obtaining the necessary water from sources outside of the drainage area of this river. Gages are still being read on certain streams, the utilization of whose flow is under consideration. The feasibility of building storage reservoirs on the lakes which form the headwaters of the Black river without flooding State lands was considered in detail.

This work was completed on April 10, 1912, and a complete report submitted to the State Engineer.

An appropriation of \$15,000 was allowed for the execution of this work. The total cost of the work was \$10,785.62, leaving a balance of \$4,214.38.

THE FOLLOWING STATEMENTS SHOW THE NAMES, RANK AND COMPENSATION OF ENGINEERS EMPLOYED IN THE MIDDLE DIVISION OF THE DEPARTMENT OF THE STATE ENGINEER AND SURVEYOR, TOGETHER WITH INCIDENTAL EXPENSES, FOR THE FISCAL YEAR ENDING SEPTEMBER 30, 1912.

Ordinary Repairs to Canals — Erie Canal.

Chapter 810, Laws of 1911.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
Edwin Styring.....	Division engineer.....	\$350 per month	\$490 00	\$23 89	\$513 89
Guy Moulton.....	First resident engineer.....	250 per month	200 00	10	200 10
D. E. Whitford.....	Assistant engineer.....	6 00 per day	156 00		156 00
R. K. Sheldon.....	Assistant engineer.....	6 00 per day	102 00		102 00
L. D. Brownell.....	Assistant engineer.....	6 00 per day	60 00	8 12	68 12
C. F. Hopstein.....	Draftsman.....	5 00 per day	50 00	25 22	75 22
E. M. Weiskotten.....	Draftsman.....	4 00 per day	144 00		144 00
J. J. Ryan.....	Tracer.....	75 per month	139 27		139 27
C. W. Diefendorf.....	Inspector.....	4 00 per day	120 00		120 00
J. D. Scanlon.....	Cadier.....	150 per month	150 00		150 00
W. S. Morris.....	Estimate clerk.....	150 per month	625 00	2 50	627 50
A. B. Dewey.....	Confidential stenographer.....	125 per month	125 00		125 00
Harvey Wagner.....	Stenographer.....	125 per month	600 00		600 00
Ferdinand Smith.....	Laborer.....	2 00 per day	632 00		632 00
C. H. Norton.....	Laborer.....	2 00 per day	310 00		310 00
L. C. Ryan.....	Laborer.....	2 00 per day	102 00		102 00
E. F. Allen.....	Laborer.....	2 00 per day	50 00		50 00
George McGlade.....	Laborer.....	2 00 per day	12 00		12 00
Paul W. Kelley.....	Chauffeur.....	100 per month	153 33		153 33
George B. Kelley.....	Chauffeur.....	100 per month	200 00	7 75	207 75
J. M. Keller.....	Telephone girl.....	20 per month	36 67		36 67
John Maley.....	Fireman.....	75 per month	225 00		225 00
William B. Byrne.....	Night watchman.....	30 per month	120 50		120 50
			\$4,802 77	\$67 58	\$4,870 35
Incidental Expenses.					
Stationery and printing.....				\$123 50	
Fuel and light.....				564 20	
Postage.....				276 94	
Telephone and telegraph.....				971 06	
Miscellaneous.....				2,206 11	
Total.....					4,141 81
					\$9,012 16

Ordinary Repairs to Canals — Black River Canal.

Chapter 810, Laws of 1911.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
Guy Moulton.....	First resident engineer.....	\$250 per month	\$50 00	\$5 91	\$55 91
R. K. Sheldon.....	Assistant engineer.....	6 00 per day	30 00	47 02	77 02
C. F. Hopstein.....	Draftsman.....	5 00 per day	35 00	10 31	45 31
C. G. Lamphere.....	Draftsman.....	4 00 per day	20 00		20 00
J. J. Ryan.....	Tracer.....	75 per month	37 50		37 50
			\$172 50	\$63 24	\$235 74
Incidental Expenses.					
Telephone and telegraph.....				\$0 35	
Miscellaneous.....				1 75	
					2 10
					\$237 84

Construction of Barge Canal — Erie Canal.

Chapter 147, Laws of 1903, and amendatory laws.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
Edwin Styring	Division engineer	\$350 per month	\$1,240 00	\$205 62	\$1,445 62
Guy Moulton	First resident engineer	250 per month	1,125 00	71 14	1,196 14
John R. Baxter	Resident engineer	250 per month	693 55		693 55
Earle Talbot	Resident engineer	250 per month	1,590 00	99 99	1,599 99
L. C. Hulburd	Resident engineer	250 per month	3,000 00	232 52	3,232 52
D. B. Donovan	Resident engineer	250 per month	693 55		693 55
D. C. Wedgeworth	Resident engineer	250 per month	2,900 00	86 40	2,986 40
E. J. Berry	Resident engineer	250 per month	2,750 00	377 48	3,127 48
Harry J. Morrison	Resident engineer	250 per month	669 35	76 36	745 71
D. B. Donovan	Assistant engineer	7 00 per day	1,631 00	39 44	1,670 44
H. J. O'Neil	Assistant engineer	6 00 per day	1,906 00	268 51	2,254 51
H. C. Smith	Assistant engineer	6 00 per day	1,903 00	233 65	2,146 65
H. A. Gehring	Assistant engineer	6 00 per day	1,416 00	39 10	1,455 10
J. G. Palmer	Assistant engineer	6 00 per day	1,926 00	252 31	2,178 31
George H. Brizze	Assistant engineer	6 00 per day	2,028 00	61 58	2,092 58
J. B. Whingle	Assistant engineer	6 00 per day	456 50	10 93	467 43
W. J. Durkin	Assistant engineer	6 00 per day	1,404 00		1,404 00
Foster B. Crocker	Assistant engineer	6 00 per day	1,920 00	315 42	2,235 42
A. G. Chrysler	Assistant engineer	6 00 per day	1,884 00	85 14	1,969 14
D. J. Levinson	Assistant engineer	6 00 per day	605 00		605 00
P. H. Budd	Assistant engineer	6 00 per day	25 00	27 92	52 92
R. K. Sheldon	Assistant engineer	6 00 per day	78 00	33 15	116 15
R. R. Stuart	Assistant engineer	6 00 per day	1,093 00		1,093 00
L. D. Brownell	Assistant engineer	6 00 per day	114 00	11 85	125 85
C. R. Chase	Assistant engineer	6 00 per day	1,968 00	449 71	2,403 71
Carl L. Bannister	Assistant engineer	6 00 per day	1,878 00	6 61	1,884 61
Charles W. Costello	Assistant engineer	6 00 per day	1,896 00	120 02	2,016 02
A. G. Card	Assistant engineer	5 50 per day	889 00	16 83	896 83
W. S. Saxton	Assistant engineer	5 50 per day	1,721 50		1,721 50
Otto Brown	Assistant engineer	5 50 per day	410 00		410 00
S. M. Stuart	Assistant engineer	5 00 per day	125 00		125 00
R. C. Hunter	Assistant engineer	5 00 per day	125 00		125 00
John L. Bush	Assistant engineer	5 00 per day	1,190 00		1,190 00
Irvin S. Badger	Assistant engineer	5 00 per day	605 00		605 00
R. E. Swinney	Assistant engineer	5 00 per day	620 00		620 00
A. W. Smith	Assistant engineer	5 00 per day	565 00		565 00
Walter F. Shaw	Assistant engineer	5 00 per day	675 00		675 00
R. W. Smith	Assistant engineer	5 00 per day	620 00		620 00
N. R. McLeod	Leveler	5 00 per day	1,720 00	218 28	1,968 28
E. J. Berry	Leveler	5 00 per day	130 00		130 00
R. E. Swinney	Leveler	5 00 per day	980 00		980 00
John F. Greathead	Leveler	5 00 per day	160 00		160 00
D. J. Levinson	Leveler	5 00 per day	1,075 00		1,075 00
Charles Donohue	Leveler	5 00 per day	1,505 00		1,505 00
A. W. Smith	Leveler	5 00 per day	360 00	31 00	391 00
Walter F. Shaw	Leveler	5 00 per day	871 50		871 50
John L. Bush	Leveler	5 00 per day	465 00		465 00
W. H. Hilborn	Leveler	5 00 per day	155 00	21 47	176 47
John B. Doughty	Leveler	4 50 per day	405 00		405 00
H. J. Stevens	Leveler	4 50 per day	1,458 00		1,458 00
Edward Dollard	Leveler	4 50 per day	477 00		477 00
John A. Sloat	Leveler	4 50 per day	1,435 50		1,435 50
John C. Lewin	Leveler	4 50 per day	312 00		312 00
R. C. Hunter	Leveler	4 50 per day	949 50		949 50
C. H. Adams	Leveler	4 50 per day	792 00		792 00
Irvin S. Badger	Leveler	4 50 per day	868 50		868 50
I. H. Smallwood	Leveler	4 50 per day	742 00		742 00
Joseph Wechsler	Leveler	4 50 per day	765 00		765 00
R. W. Smith	Leveler	4 50 per day	112 50		112 50
Jacob Gadowitz	Leveler	4 50 per day	351 00		351 00
B. A. Krotin er	Leveler	4 50 per day	207 00		207 00
Louis R. Bennett	Rodman	4 00 per day	1,320 50		1,320 50
P. C. Gallup	Rodman	4 00 per day	1,261 00		1,261 00
John J. Gawkins	Rodman	4 00 per day	1,312 00	20 41	1,332 41
John L. Doyle	Rodman	4 00 per day	1,122 00		1,122 00
L. A. Haquenbourg	Rodman	4 00 per day	188 00		188 00
L. H. Coit	Rodman	4 00 per day	1,192 50		1,192 50
A. R. Patchke	Rodman	4 00 per day	264 00		264 00
G. H. Thomas	Rodman	4 00 per day	1,416 00		1,416 00
Don A. Wilcox	Rodman	4 00 per day	1,360 00		1,360 00
W. B. Cook	Rodman	4 00 per day	1,068 00		1,068 00
F. A. Gordon	Rodman	4 00 per day	576 00		576 00

Construction of Barge Canal — Erie Canal — (Continued).

Chapter 147, Laws of 1903, and amendatory laws.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
S. B. Sheriden.....	Rodman.....	\$4 00 per day	\$1,003 00	\$25 75	\$1,028 75
M. H. Boigcol.....	Rodman.....	4 00 per day	708 00		708 00
F. M. White.....	Rodman.....	3 50 per day	10 50		10 50
George F. Baker.....	Rodman.....	3 50 per day	1,099 00		1,099 00
E. C. Ainsley.....	Rodman.....	3 50 per day	108 50		108 50
James Conley.....	Rodman.....	3 50 per day	161 00		161 00
H. W. Baker.....	Rodman.....	3 50 per day	406 00		406 00
Powell Wa'l.....	Rodman.....	3 50 per day	472 50		472 50
Paul T. Wheeler.....	Rodman.....	3 50 per day	42 00		42 00
Edgar N. Scott.....	Rodman.....	3 50 per day	385 00		385 00
H. W. Grow.....	Rodman.....	3 50 per day	388 50		388 50
E. C. Neudecker.....	Rodman.....	3 50 per day	364 00		364 00
Casper M. Connery.....	Rodman.....	3 50 per day	1,120 00		1,120 00
Thomas L. Way.....	Rodman.....	3 50 per day	339 50		339 50
J. S. Bierhardt.....	Rodman.....	3 50 per day	1,165 50		1,165 50
Joseph Wechsler.....	Rodman.....	3 50 per day	402 50		402 50
P. J. Barron.....	Rodman.....	3 50 per day	35 00	19 65	54 65
Max Goodman.....	Rodman.....	3 50 per day	269 50		269 50
Guy L. Smith.....	Rodman.....	3 50 per day	329 00		329 00
Henry Heffernan.....	Rodman.....	3 50 per day	339 50		339 50
Harry R. Topping.....	Rodman.....	3 50 per day	259 00		259 00
Guy M. Phelps.....	Rodman.....	3 50 per day	63 00		63 00
Grover A. Woodard.....	Rodman.....	3 50 per day	87 50		87 50
J. J. Phalan.....	Rodman.....	3 50 per day	1,106 00		1,106 00
D. A. McClellan.....	Rodman.....	3 50 per day	1,123 50		1,123 50
C. V. O'Malley.....	Rodman.....	3 50 per day	1,081 50	21 25	1,102 75
F. Lewis.....	Rodman.....	3 50 per day	441 00		441 00
H. C. Smith.....	Rodman.....	3 50 per day	1,106 00		1,106 00
Allen A. Patterson.....	Rodman.....	3 50 per day	1,085 00		1,085 00
C. N. Budlong.....	Chainman.....	3 00 per day	252 00		252 00
Robert E. Gallavin.....	Chainman.....	3 00 per day	942 00		942 00
L. A. Kavanagh.....	Chainman.....	3 00 per day	978 00		978 00
Frank Lutz.....	Chainman.....	3 00 per day	963 00		963 00
E. G. Warner.....	Chainman.....	3 00 per day	939 00		939 00
Roy E. Homan.....	Chainman.....	3 00 per day	981 00		981 00
Mathew J. Chryst.....	Chainman.....	3 00 per day	858 00		858 00
Henry C. Little.....	Chainman.....	3 00 per day	942 00	103 18	1,045 18
F. C. Curtin.....	Chainman.....	3 00 per day	39 00		39 00
William Smutsler.....	Chainman.....	2 50 per day	517 50		517 50
J. H. McEntee.....	Chainman.....	2 50 per day	357 50		357 50
Howard W. Loftus.....	Chainman.....	2 50 per day	790 00		790 00
John L. Dowd, Jr.....	Chainman.....	2 50 per day	787 50		787 50
Clarence L. Fox.....	Chainman.....	2 50 per day	912 50		912 50
M. W. Booth.....	Chainman.....	2 50 per day	205 00		205 00
Morris Alter.....	Chainman.....	2 50 per day	527 50		527 50
Morris Straus.....	Chainman.....	2 50 per day	787 50		787 50
James P. Mullen.....	Chainman.....	2 50 per day	980 00		980 00
E. C. Neudecker.....	Chainman.....	2 50 per day	527 50		527 50
J. J. Quinn.....	Chainman.....	2 50 per day	137 50		137 50
Walter M. Jackson, Jr.....	Chainman.....	2 50 per day	27 50		27 50
George L. Dunlop.....	Chainman.....	2 50 per day	67 50		67 50
Joseph J. Darcy.....	Chainman.....	2 50 per day	567 50	1 35	568 85
William H. Barhyte.....	Chainman.....	2 50 per day	597 50		597 50
Earl J. Bullis.....	Chainman.....	2 50 per day	310 00		310 00
W. J. Curtis.....	Chainman.....	2 50 per day	884 00		884 00
H. W. Grow.....	Chainman.....	2 50 per day	100 00		100 00
Samuel Covner.....	Chainman.....	2 50 per day	107 50		107 50
Guy L. Smith.....	Chainman.....	2 50 per day	52 50		52 50
Edward T. Gawkins.....	Chainman.....	2 50 per day	212 50		212 50
J. T. Phalan.....	Chainman.....	2 50 per day	235 00		235 00
William J. Lewis.....	Chainman.....	2 50 per day	192 50		192 50
Henry TenHagen.....	Chainman.....	2 50 per day	112 50		112 50
D. E. Robbins.....	Chainman.....	2 50 per day	197 50		197 50
Dennis B. Lynch.....	Chainman.....	2 50 per day	80 00		80 00
Thomas Farrell.....	Chainman.....	2 50 per day	115 00		115 00
Arthur Johnson.....	Laborer.....	2 00 per day	302 00		302 00
Bernard Steinberg.....	Laborer.....	2 00 per day	290 00		290 00
W. Lester Grogan.....	Laborer.....	2 00 per day	108 00		108 00
James Cross.....	Laborer.....	2 00 per day	196 00		196 00
William Persall.....	Laborer.....	2 00 per day	14 00		14 00
William D. Pardee.....	Laborer.....	2 00 per day	26 00		26 00
Albert Brown.....	Laborer.....	2 00 per day	40 00		40 00

Construction of Barge Canal — Erie Canal — (Continued).

Chapter 147, Laws of 1903, and amendatory laws.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
Daniel D. Donovan	Laborer	\$2 00 per day	\$626 00		\$626 00
Ben Sexton	Laborer	2 00 per day	28 00		28 00
Clarence Phelps	Laborer	2 00 per day	666 00		666 00
James Ward	Laborer	2 00 per day	358 00		358 00
C. Donovan	Laborer	2 00 per day	208 00		208 00
J. C. McElroy	Laborer	2 00 per day	422 00		422 00
Herbert Hitchings	Laborer	2 00 per day	600 00		600 00
James Keating	Laborer	2 00 per day	684 00		684 00
Otis Van Wie	Laborer	2 00 per day	626 00		626 00
H. M. Fancher	Laborer	2 00 per day	324 00		324 00
William T. Tanner, Jr.	Laborer	2 00 per day	654 00		654 00
Dennis Murray	Laborer	2 00 per day	476 00		476 00
G. H. Krug	Laborer	2 00 per day	36 00		35 00
Thomas Lewis	Laborer	2 00 per day	34 00		34 00
E. Herrick	Laborer	2 00 per day	34 00		34 00
L. Denner, Jr.	Laborer	2 00 per day	130 00		130 00
E. F. Allen	Laborer	2 00 per day	54 00		54 00
James Maroney	Laborer	2 00 per day	104 00		104 00
Henry Akin	Laborer	2 00 per day	608 00		608 00
George Grogan	Laborer	2 00 per day	640 00		640 00
John Copia	Laborer	2 00 per day	630 00		630 00
William Farrier	Laborer	2 00 per day	648 00		648 00
Frank J. Lynch	Laborer	2 00 per day	626 00		626 00
Leo B. Brennan	Laborer	2 00 per day	228 00		228 00
Andrew Dardis	Laborer	2 00 per day	614 00		614 00
Frank A. Wiltse	Laborer	2 00 per day	230 00		230 00
Joseph Reh	Laborer	2 00 per day	630 00		630 00
William P. Rayland	Laborer	2 00 per day	636 00		636 00
Horace Stewart	Laborer	2 00 per day	228 00		228 00
John H. Boyland	Laborer	2 00 per day	102 00		102 00
Charles H. Sponenburg	Laborer	2 00 per day	108 00		108 00
G. E. Cahill	Laborer	2 00 per day	18 00		18 00
William Abbott	Laborer	2 00 per day	6 00		6 00
Louis C. Ryan	Laborer	2 00 per day	106 00		106 00
Bradford Drake	Laborer	2 00 per day	98 00		98 00
John P. Maroney	Laborer	2 00 per day	376 00		376 00
Thomas Nugent	Laborer	2 00 per day	498 00		498 00
Edward T. Gawkins	Laborer	2 00 per day	360 00		360 00
Clarence Smith	Laborer	2 00 per day	220 00		220 00
Francis Daly	Laborer	2 00 per day	492 00		492 00
Clark H. Norton	Laborer	2 00 per day	102 00		102 00
John Dygert	Laborer	2 00 per day	50 00		50 00
W. H. Rundle	Boatman	3 00 per day	750 00		750 00
E. P. Downer	Boatman	3 00 per day	804 00		804 00
Oscar Svenson	Boatman	3 00 per day	924 00		924 00
Daniel Kilmore	Boatman	3 00 per day	801 00		801 00
William Potter	Boatman	3 00 per day	372 00		372 00
Fred Sweet	Boatman	3 00 per day	939 00		939 00
Charles Sponenburg	Boatman	3 00 per day	786 00		786 00
Thomas Gray	Boatman	3 00 per day	939 00		939 00
Joseph F. O'Brien	Boatman	3 00 per day	984 00		984 00
William Biehler	Boatman	3 00 per day	519 00		519 00
Samuel Holstein	Boatman	3 00 per day	72 00		72 00
Frank Ladd	Boatman	3 00 per day	516 00		516 00
G. R. Steadman	Boatman	3 00 per day	372 00		372 00
W. M. Brewer	Boatman	3 00 per day	291 00		291 00
James L. Grogan	Boatman	3 00 per day	81 00		81 00
A. W. Bischell	Axeman	2 00 per day	588 00		588 00
Ward T. Marriott	Axeman	2 50 per day	812 50		812 50
C. F. Hopstein	Draftsman	5 00 per day	440 00	\$170 28	610 28
R. M. Fraser	Draftsman	5 00 per day	1,585 00		1,585 00
C. G. Lamphere	Draftsman	4 00 per day	1,208 00	28 37	1,236 37
L. H. Friedman	Draftsman	125 per month	60 48		60 48
E. M. Weiskotten	Draftsman	4 00 per day	648 00		648 00
H. W. Baker	Draftsman	4 00 per day	40 00		40 00
Harold M. Cox	Draftsman	4 00 per day	68 00		68 00
Jerry J. Ryan	Tracer	75 per month	200 55	5 75	206 30
S. M. Stuart	Masonry inspector	5 00 per day	1,080 00		1,080 00
W. J. Kelly	Masonry inspector	5 00 per day	1,060 00		1,060 00
Alfred Evans	Masonry inspector	5 00 per day	1,670 00		1,670 00
John B. Doughty	Masonry inspector	4 00 per day	28 00		28 00
C. W. Diefendorf	Masonry inspector	4 50 per day	607 50		607 50

Construction of Barge Canal — Erie Canal — (Concluded).

Chapter 147, Laws of 1903, and amendatory laws.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
M. G. Case.....	Masonry inspector.....	\$3 50 per day	\$245 00		\$245 00
William Heimann, Jr....	Masonry inspector.....	3 50 per day	122 50		122 50
Frank De Vall.....	Masonry inspector.....	3 50 per day	150 50		150 50
W. S. Morris.....	Estimate clerk.....	150 per month	900 00		900 00
John D. Scanlon.....	Cashier.....	150 per month	750 00		750 00
Arthur B. Dewey.....	Confidential stenographer.....	125 per month	500 00		500 00
L. J. Mulhauser.....	Stenographer.....	125 per month	1,400 00		1,400 00
Harvey Wagner.....	Stenographer.....	125 per month	225 00		225 00
Paul Kelley.....	Chauffeur.....	100 per month	200 00		200 00
George B. Kelley.....	Chauffeur.....	100 per month	200 00	\$9 66	209 66
L. W. Moulton.....	Gage reader.....	5 00 per month	60 00		60 00
Frank Shane.....	Gage reader.....	5 00 per month	60 00		60 00
William H. Burns.....	Gage reader.....	5 00 per month	60 00		60 00
William Prettie.....	Gage reader.....	10 00 per month	115 00		115 00
Mark Quimby.....	Gage reader.....	5 00 per month	60 00		60 00
J. H. Rupert.....	Gage reader.....	5 00 per month	60 00		60 00
Floyd Bettinger.....	Gage reader.....	7 00 per month	84 00		84 00
Marie Brandt Brown....	Gage reader.....	7 00 per month	84 00		84 00
Daniel Brown.....	Gage reader.....	7 00 per month	84 00		84 00
W. T. Crill.....	Gage reader.....	7 00 per month	84 00		84 00
Mrs. A. H. Hoffmeister.	Gage reader.....	7 00 per month	84 00		84 00
E. A. Hurlbut.....	Gage reader.....	7 00 per month	23 00		23 00
Clyde Judge.....	Gage reader.....	7 00 per month	84 00		84 00
A. H. La Fevre.....	Gage reader.....	7 00 per month	84 00		84 00
H. F. Mason.....	Gage reader.....	7 00 per month	63 00		63 00
Marie Powell.....	Gage reader.....	7 00 per month	84 00		84 00
Henry Straub.....	Gage reader.....	7 00 per month	84 00		84 00
Griff G. Williams.....	Gage reader.....	7 00 per month	84 00		84 00
John Phillips.....	Gage reader.....	6 00 per month	72 00		72 00
W. H. Dunn.....	Gage reader.....	5 00 per month	60 00		60 00
E. A. Evans.....	Gage reader.....	5 00 per month	20 00		20 00
Chris Hannon.....	Gage reader.....	4 00 per month	48 00		48 00
Charles Brannock.....	Gage reader.....	10 00 per month	120 00		120 00
Lewis McArthur.....	Gage reader.....	10 00 per month	120 00		120 00
John Hillyer.....	Gage reader.....	7 00 per month	84 00		84 00
Solomon Walts.....	Gage reader.....	7 00 per month	28 00		28 00
Charles Bourke.....	Gage reader.....	5 00 per month	60 00		60 00
John Chamberlain.....	Gage reader.....	5 00 per month	60 00		60 00
W. M. Hubbard.....	Gage reader.....	5 00 per month	40 00		40 00
Mark Kennedy.....	Gage reader.....	5 00 per month	60 00		60 00
Tally Goodfellow.....	Gage reader.....	7 00 per month	23 00		23 00
George Heagle.....	Gage reader.....	5 00 per month	20 00		20 00
Arthur Mason.....	Gage reader.....	7 00 per month	21 00		21 00
George E. Wright.....	Livery.....			416 00	416 00
Mrs. Grace Keating.....	Livery.....			482 00	482 00
C. E. Smith.....	Livery.....			144 00	144 00
Moses Barney Estate....	Livery.....			25 50	25 50
David Butler.....	Livery.....			349 00	349 00
E. Costello.....	Livery.....			180 00	180 00
Frank E. Henabray.....	Livery.....			460 00	460 00
L. C. O'Neil.....	Livery.....			103 00	103 00
Mrs. B. Van Ertfelda....	Livery.....			51 00	51 00
Arthur Archambo.....	Livery.....			30 00	30 00
Charles Swan.....	Livery.....			756 00	756 00
James Roberts.....	Livery.....			49 50	49 50
George H. Shufelt.....	Livery.....			498 50	498 50
C. L. Hickland.....	Livery.....			1,060 00	1,060 00
H. G. Donovan.....	Livery.....			920 00	920 00
Charles H. Connor.....	Livery.....			318 00	318 00
					\$157,725 56
<i>Incidental expenses.</i>					
Instruments, tools and appliances.....				\$189 15	
Office rent.....				1,517 00	
Fuel and light.....				525 92	
Stationery and printing.....				133 62	
Postage.....				331 14	
Telephone and telegraph.....				708 09	
Miscellaneous.....				8,042 47	
					11,527 39
Total.....					\$160,252 95

Construction of Barge Canal — Oswego Canal.

Chapter 147, Laws of 1903, and amendatory laws.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
Edwin Styring	Division engineer	\$350 per month	\$1,170 00	\$101 35	\$1,271 35
Guy Moulton	First resident engineer	250 per month	775 00	20 45	795 45
James Burden	Resident engineer	250 per month	3,000 00	173 54	3,173 54
Theron M. Ripley	Resident engineer	250 per month	3,000 00	414 76	3,414 76
George C. Andrews	Resident engineer	250 per month	588 71	10 90	599 61
George H. Haley	Resident engineer	250 per month	801 54	6 18	807 72
H. J. Scheuermann	Bridge designer	175 per month	175 00	4 71	179 71
John G. Scanlon	Cashier	150 per month	750 00		750 00
W. S. Morris	Estimate clerk	150 per month	175 00		175 00
A. B. Dewey	Confidential stenographer	125 per month	750 00		750 00
Harvey Wagner	Stenographer	125 per month	250 00		250 00
W. D. Gartland	Stenographer	75 per month	840 00		840 00
Chester C. Hahn	Stenographer	60 per month	704 52		704 52
Walter L. Collins	Stenographer	60 per month	21 29		21 29
George C. Andrews	Assistant engineer	6 00 per day	1,260 00	21 88	1,281 88
Edward M. Ellis	Assistant engineer	6 00 per day	2,070 00	712 49	2,782 49
George H. Haley	Assistant engineer	6 00 per day	1,374 00	5 77	1,379 77
R. K. Sheldon	Assistant engineer	6 00 per day	540 00	14 90	554 90
D. H. Judson	Assistant engineer	5 50 per day	1,771 00		1,771 00
P. H. Budd	Assistant engineer	5 00 per day	600 00	70 50	670 50
F. H. Flint	Assistant engineer	5 00 per day	665 00		665 00
H. H. Brown	Assistant engineer	5 00 per day	480 00		480 00
Solomon Reswick	Assistant engineer	5 00 per day	125 00	38 60	163 60
F. H. Flint	Leveler	5 00 per day	995 00		995 00
W. H. Carnrike	Leveler	4 50 per day	1,422 00		1,422 00
Carl Moulton	Leveler	4 50 per day	1,471 50		1,471 50
John G. Ettinger	Leveler	4 50 per day	652 50		652 50
C. E. Larned	Leveler	4 50 per day	724 50		724 50
A. D. Brown	Leveler	4 50 per day	297 00		297 00
H. A. Armstrong	Leveler	4 50 per day	477 00		477 00
H. H. Brown	Leveler	5 00 per day	1,105 00		1,105 00
George C. Hannon	Leveler	5 00 per day	1,605 00		1,605 00
E. J. Clohessy	Leveler	4 50 per day	1,408 50		1,408 50
P. H. Budd	Leveler	5 00 per day	945 00	187 51	1,132 51
M. D. Ewell	Leveler	5 00 per day	1,565 00	40 52	1,605 52
William H. Hilborn	Leveler	5 00 per day	1,430 00	32 75	1,462 75
L. H. Friedman	Bridge draftsman	125 per month	231 52		231 52
C. H. Hopstein	Draftsman	5 00 per day	110 00	21 85	131 85
H. A. J. Castor	Draftsman	5 00 per day	1,565 00		1,565 00
Harry Kehoe	Draftsman	5 00 per day	1,565 00		1,565 00
John D. Ettinger	Draftsman	4 00 per day	728 00		728 00
L. H. Wright	Rodman	4 00 per day	1,054 00		1,054 00
Philip J. Baron	Rodman	3 50 per day	822 50		822 50
Clyde E. Learned	Rodman	4 00 per day	748 00		748 00
R. M. Mark	Rodman	4 00 per day	1,285 50		1,285 50
A. J. Mantica	Rodman	3 50 per day	52 50		52 50
William H. Carnrike	Rodman	3 50 per day	21 00		21 00
Earle K. Dewey	Rodman	3 50 per day	108 50		108 50
Leon C. Loomis	Rodman	3 50 per day	385 00		385 00
Andrew J. Crowe, Jr.	Rodman	3 50 per day	1,154 00		1,154 00
Max Goodman	Rodman	3 50 per day	42 00		42 00
Nathan J. Freedman	Rodman	3 50 per day	259 00		259 00
Vernon Vandeberg	Rodman	3 50 per day	353 50		353 50
F. C. Sellnow	Rodman	3 50 per day	182 00		182 00
W. W. Redfern	Chainman	3 00 per day	982 50		982 50
A. T. Brown	Chainman	3 00 per day	988 50		988 50
Roy Ennell	Chainman	3 00 per day	853 50		853 50
R. J. Storm	Chainman	3 00 per day	977 50		977 50
William Crahan	Chainman	3 00 per day	1,026 00		1,026 00
J. C. Adams	Chainman	3 00 per day	345 00		345 00
F. C. Curtin	Chainman	3 00 per day	676 00		676 00
E. H. Assenheimer	Chainman	3 00 per day	898 00		898 00
Joseph Rosenweig	Chainman	2 50 per day	787 50		787 50
G. E. Cahill	Chainman	2 50 per day	7 50		7 50
J. E. Smith	Chainman	3 00 per day	333 00		333 00
M. J. Kelly	Chainman	2 50 per day	797 00		797 00
M. W. Booth	Chainman	2 50 per day	427 50		427 50
Louis Salmowits	Chainman	2 50 per day	25 00		25 00
P. N. Edwards	Chainman	2 50 per day	135 00		135 00
James B. Sullivan	Chainman	3 00 per day	156 00		156 00

Construction of Barge Canal — Oswego Canal — (Concluded).

Chapter 147, Laws of 1903, and amendatory laws.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
W. N. Dutcher.....	Inspector.....	\$5 00 per day	\$1,715 00		\$1,715 00
A. H. Hallenbeck.....	Inspector.....	5 00 per day	1,685 00		1,685 00
W. A. Walter.....	Inspector.....	5 00 per day	1,640 00		1,640 00
W. J. Kelly.....	Inspector.....	5 00 per day	610 00		610 00
Charles B. Herring.....	Inspector.....	3 50 per day	136 50		136 50
Alfred Moosbrugger.....	Axeman.....	2 50 per day	822 50		822 50
Foster J. Beach.....	Axeman.....	2 00 per day	636 00		636 00
Patrick Ryan.....	Boatman.....	3 00 per day	939 00		939 00
James Griffin.....	Boatman.....	3 00 per day	846 00		846 00
James McKay.....	Boatman.....	3 00 per day	948 00		948 00
Thomas Redmond.....	Boatman.....	3 00 per day	447 00		447 00
James A. Lair.....	Boatman.....	3 00 per day	336 00		336 00
John Shay.....	Boatman.....	3 00 per day	156 00		156 00
Oscar Svenson.....	Boatman.....	3 00 per day	18 00	\$12 86	30 86
James L. Grogan.....	Boatman.....	3 00 per day	159 00		159 00
L. A. Halpin.....	Boatman.....	3 00 per day	81 00		81 00
L. C. Ryan.....	Laborer.....	2 00 per day	288 00		288 00
Henry Turk.....	Laborer.....	2 00 per day	626 00		626 00
T. R. Ward.....	Laborer.....	2 00 per day	732 00		732 00
William Cullen.....	Laborer.....	2 00 per day	518 00		518 00
W. A. Cronin.....	Laborer.....	2 00 per day	626 00		626 00
A. M. Roy.....	Laborer.....	2 00 per day	228 00		228 00
D. Heenan.....	Laborer.....	2 00 per day	44 00		44 00
William Fitzgibbons, Jr.....	Laborer.....	2 00 per day	640 00		640 00
M. E. Murray.....	Laborer.....	2 00 per day	468 00		468 00
Jesse Penfield.....	Laborer.....	2 00 per day	632 00		632 00
John Madigan.....	Laborer.....	2 00 per day	456 00		456 00
Thomas Brady.....	Laborer.....	2 00 per day	638 00		638 00
Daniel Mehegan.....	Laborer.....	2 00 per day	648 00		648 00
H. C. Watson.....	Laborer.....	2 00 per day	103 00		108 00
Claude Althouse.....	Laborer.....	2 00 per day	574 00		574 00
C. H. Norton.....	Laborer.....	2 00 per day	52 00		52 00
William Cavanagh.....	Laborer.....	2 00 per day	304 00		304 00
Edward H. Kimball.....	Laborer.....	2 00 per day	230 00		230 00
Thomas Storrier.....	Laborer.....	2 00 per day	70 00		70 00
P. L. Ryan.....	Laborer.....	2 00 per day	104 00		104 00
J. L. Powers.....	Laborer.....	2 00 per day	16 00		16 00
Alonzo Clark.....	Laborer.....	2 00 per day	542 00		542 00
John Dygert.....	Laborer.....	2 00 per day	584 00		584 00
Peter Griffin.....	Laborer.....	2 00 per day	288 00		288 00
J. M. Foley.....	Laborer.....	2 00 per day	666 00		666 00
William Griggs, Jr.....	Laborer.....	2 00 per day	608 00		608 00
George Archambo.....	Gage reader.....	6 00 per month	72 00		72 00
Leon Hallenbeck.....	Gage reader.....	5 00 per month	60 00		60 00
Arthur C. Owens.....	Gage reader.....	5 00 per month	20 00		20 00
Smith Sharp.....	Gage reader.....	5 00 per month	20 00		20 00
L. D. Sterling.....	Gage reader.....	5 00 per month	20 00		20 00
Bert Thomas.....	Gage reader.....	5 00 per month	60 00		60 00
D. D. Tompkins.....	Gage reader.....	5 00 per month	60 00		60 00
B. M. Wilcox.....	Gage reader.....	5 00 per month	60 00		60 00
James J. Frisbie.....	Gage reader.....	5 00 per month	40 00		40 00
Fulton Livery Co.....				583 00	583 00
M. T. Crimmins.....				150 00	150 00
			\$78,404 08	\$2,624 52	\$81,028 60
<i>Incidental Expenses.</i>					
Instruments and tools.....				\$258 93	
Office rent.....				1,163 96	
Fuel and light.....				281 29	
Stationery and printing.....				74 07	
Postage.....				181 21	
Telegraph and telephone.....				434 84	
Miscellaneous.....				3,815 25	
					6,209 55
Total.....					\$87,238 15

Construction of Barge Canal — Cayuga and Seneca Canal.

Chapter 391, Laws of 1909; Chapter 214, Laws of 1911; Chapter 339, Laws of 1911.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
Edwin Styring	Division engineer	\$350 per month	\$1,300 00	\$90 44	\$1,390 44
G. F. Stickney	Supervising engineer	5,000 per year	1,666 67		1,666 67
W. H. Yates	Supervising engineer	4,000 per year	1,222 21	15 75	1,237 96
M. G. Barnes	Consulting engineer	60 00 per day	740 00	76 01	816 01
G. S. Green, Jr.	Consulting engineer	60 00 per day	420 00	51 65	471 65
D. Kennard Thompson	Consulting engineer	60 00 per day	420 00	45 01	465 01
William H. Burr	Consulting engineer	60 00 per day	300 00	37 98	337 98
Joseph Ripley	Consulting engineer	600 per month	292 90	50 50	343 40
Thomas Hasset	Confidential assistant			24 20	24 20
A. E. Steere	Resident engineer	250 per month	2,600 00	112 01	2,712 01
R. E. Phillips	Resident engineer	200 per month	13 33	14 35	27 68
G. E. Gibson	Assistant engineer	7 00 per day	2,025 83		2,025 83
L. S. Hulburd	Resident engineer	250 per month	2,800 00	195 36	2,995 36
Guy Moulton	First resident engineer	250 per month	300 00	1 40	301 40
Waldo G. Wildes	Resident engineer	250 per month	14 52	3 24	17 76
Noble E. Whitford	Resident engineer	250 per month	17 24	11 09	28 33
H. J. Scheuermann	Bridge designer	175 per month	875 00		875 00
Horace Corbin	Bridge designer	150 per month	55 00		55 00
R. B. Allen	Draftsman	4 00 per day	52 00		52 00
C. M. Chuckrow	Draftsman	4 00 per day	52 00		552 00
Charles Messina	Draftsman	4 00 per day	52 00		52 00
J. H. McCormick, Jr.	Draftsman	5 00 per day	65 00		65 00
C. F. Hopstein	Draftsman	5 00 per day		3 38	3 38
J. H. Stevens	Draftsman	5 00 per day	65 00		65 00
S. T. Vosburgh	Draftsman	5 00 per day	65 00		65 00
L. B. Westfall	Draftsman	5 00 per day	65 00		65 00
George D. Meer	Draftsman	5 00 per day	10 00	12 32	22 32
J. J. Cosgrave	Architectural draftsman	150 per month	75 00		75 00
A. Bluestone	Junior bridge draftsman	75 per month	25 00		25 00
C. A. Huhne	Junior bridge draftsman	75 per month	35 00		35 00
C. J. Hall	Tracer	60 per month	30 00		30 00
W. J. Henk	Tracer	75 per month	360 00		360 00
John D. Scanlon	Cashier	150 per month	150 00		150 00
A. B. Dewey	Confidential stenographer	125 per month	125 00		125 00
Harvey Wagner	Stenographer	125 per month	250 00		250 00
C. W. Diefendorf	Inspector	3 50 per day	283 50		283 50
R. W. Barrett	Assistant engineer	5 00 per day	65 00		65 00
M. W. Grimes	Assistant engineer	6 00 per day	78 00		78 00
C. L. Hayward	Assistant engineer	6 00 per day	78 00		78 00
T. R. Hazelum	Assistant engineer	5 00 per day	65 00		65 00
I. S. Matlaw	Assistant engineer	7 00 per day	91 00		91 00
S. R. Tighe	Assistant engineer	5 00 per day	65 00		65 00
H. A. Weeks	Assistant engineer	7 00 per day	91 00		91 00
J. B. Whipple	Assistant engineer	6 00 per day	78 00		78 00
L. D. Brownell	Assistant engineer	6 00 per day	102 00	116 93	218 93
Thomas R. Tetley, Jr.	Assistant engineer	6 00 per day	1,878 00	77 56	1,955 56
R. W. Cady	Assistant engineer	6 00 per day	1,962 00	81 42	2,043 42
B. I. Hall	Assistant engineer	6 00 per day	1,716 00	127 03	1,843 03
L. L. Hadley	Leveler	5 00 per day	1,535 00	59 37	1,644 37
J. M. Prior	Leveler	5 00 per day	702 00		702 00
E. S. Overbaugh	Leveler	4 50 per day	670 50	6 19	676 69
H. S. Sparr	Leveler	5 00 per day	1,565 00		1,565 00
E. A. Duschak	Leveler	5 00 per day	1,535 00		1,535 00
H. J. Stabile	Leveler	4 50 per day	666 00		666 00
R. E. Drake	Leveler	5 00 per day	1,642 00	1 85	1,643 85
L. E. Moyer	Rodman	3 50 per day	966 00	10 25	976 25
M. L. Babcock	Rodman	3 50 per day	1,123 50		1,123 50
H. L. Drake	Rodman	3 50 per day	1,099 00		1,099 00
C. S. Deitz	Rodman	4 00 per day	792 00		792 00
W. C. Stuart	Rodman	3 50 per day	793 50	12 19	805 69
F. E. Hardy	Rodman	3 50 per day	182 00		182 00
S. M. Messer	Chainman	2 50 per day	215 00	3 20	218 20
Frank Layburn	Chainman	2 50 per day	998 50		998 50
William Branch	Chainman	2 50 per day	412 50		412 50
Thomas Redmond	Boatman	3 00 per day	712 00		712 00
C. G. McCarthy	Boatman	3 00 per day	144 00		144 00
Charles Sterling	Boatman	3 00 per day	144 00		144 00
William H. Rundle	Boatman	3 00 per day	183 00		183 00
James L. Grogan	Boatman	3 00 per day	624 00		624 00
J. H. McCabe	Boatman	3 00 per day	996 00		996 00
James Hutt	Boatman	3 00 per day	18 00	4 14	22 14

Construction of Barge Canal — Cayuga and Seneca Canal —
(Concluded).

Chapter 321, Laws of 1900; Chapter 214, Laws of 1911; Chapter 339, Laws of 1911.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
John Shay.....	Boatman.....	\$3 00 per day	\$48 00		\$48 00
Philip S. Steigman.....	Axeman.....	2 00 per day	36 00		36 00
H. W. Stoneburg.....	Foreman of borings.....	4 00 per day	324 00	\$9 42	333 42
Fred H. Palmer.....	Foreman of borings.....	4 00 per day	276 00	22 46	298 46
Henry Oakes.....	Laborer.....	2 00 per day	260 00		260 00
Bernard Kirk.....	Laborer.....	2 00 per day	468 00		468 00
George J. Farrell.....	Laborer.....	2 00 per day	646 00		646 00
Dean Davis.....	Laborer.....	2 00 per day	764 00		764 00
James Tobin.....	Laborer.....	2 00 per day	254 00		254 00
George McGrain.....	Laborer.....	2 00 per day	172 00		172 00
Leon Tunney.....	Laborer.....	2 00 per day	96 00		96 00
D. B. Haumer.....	Laborer.....	2 00 per day	92 00		92 00
Peter Woods.....	Laborer.....	2 00 per day	6 00		6 00
Charles Haasan.....	Laborer.....	2 00 per day	28 00		28 00
F. P. Ryan.....	Laborer.....	2 00 per day	630 00		630 00
John J. Tubridy.....	Laborer.....	2 00 per day	46 00		46 00
Peter McKevitt.....	Laborer.....	2 00 per day	584 00		584 00
C. A. Hawes.....	Laborer.....	2 00 per day	96 00		96 00
Charles E. Skinner.....	Laborer.....	2 00 per day	26 00		26 00
L. A. Cowing.....	Laborer.....	2 00 per day	226 00		226 00
John F. Sullivan.....	Laborer.....	2 00 per day	20 00		20 00
P. J. Cullen.....	Laborer.....	2 00 per day	96 00		96 00
Thomas Brown.....	Laborer.....	2 00 per day	12 00		12 00
W. D. Knapp.....	Laborer.....	2 00 per day	96 00		96 00
Seaman Knapp.....	Laborer.....	2 00 per day	32 00		32 00
W. F. Macreery.....	Laborer.....	2 00 per day	74 00		74 00
R. A. Petrone.....	Laborer.....	2 00 per day	32 00		32 00
Henry O'Connell.....	Laborer.....	2 00 per day	88 00		88 00
Frank T. Whalan.....	Laborer.....	2 00 per day	32 00		32 00
Patrick McGuire.....	Laborer.....	2 00 per day	376 00		376 00
James Thorne.....	Laborer.....	2 00 per day	612 00		612 00
John Costigan.....	Laborer.....	2 00 per day	636 00		636 00
John Marshall.....	Laborer.....	2 00 per day	528 00		528 00
J. H. McCarthy.....	Laborer.....	2 00 per day	72 00		72 00
Emmett Durkan.....	Laborer.....	2 00 per day	2 00		2 00
William Brown.....	Laborer.....	2 00 per day	96 00		96 00
Martin Casey.....	Laborer.....	2 00 per day	182 00		182 00
John McGrain.....	Laborer.....	2 00 per day	345 00		345 00
Francis J. Clary.....	Laborer.....	2 00 per day	122 00		122 00
L. C. Ryan.....	Laborer.....	2 00 per day	108 00		108 00
Benjamin Rogers.....	Laborer.....	2 00 per day	14 00		14 00
E. F. Allen.....	Laborer.....	2 00 per day	50 00		50 00
John D. Marshall.....	Laborer.....	2 00 per day	12 00		12 00
J. J. Maloney.....	Laborer.....	2 00 per day	112 00		112 00
William H. Grover.....	Gage reader.....	10 00 per month	43 10		43 10
John Coffee.....	Gage reader.....	7 00 per month	28 00		28 00
Edward Fitzgerald.....	Gage reader.....	7 00 per month	84 00		84 00
Anna L. Green.....	Gage reader.....	7 00 per month	28 00		28 00
A. H. O'Reilly.....	Gage reader.....	7 00 per month	84 00		84 00
Warren Van Ripper.....	Gage reader.....	7 00 per month	42 00		42 00
John Quail.....	Gage reader.....	5 00 per month	60 00		60 00
Seymour Addis.....	Gage reader.....	10 00 per month	85 48		85 48
D. M. Kellogg.....				532 00	532 00
			\$50,171 28	\$1,808 70	\$51,979 98
Incidental Expenses.					
Instruments and tools.....				\$65 52	
Office rent.....				471 25	
Fuel and light.....				70 95	
Stationery and printing.....				12 68	
Postage.....				34 24	
Telephone and telegraph.....				135 52	
Miscellaneous.....				1,771 80	
Total.....					2,561 96
					\$54,541 94

Franklin Street Bridge, Syracuse.

Chapter 453, Laws of 1909; Chapter 527, Laws of 1910.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
R. K. Sheldon	Assistant engineer	\$6 00 per day	\$750 00		\$750 00
L. D. Brownell	Assistant engineer	6 00 per day	108 00		108 00
C. W. Diefendorf	Masonry inspector	3 50 per day	341 00	\$5 34	346 34
C. F. Hopstein	Draftsman	4 00 per day	10 00		10 00
Jerry J. Ryan	Tracer	75 per month	45 50		45 50
M. J. Chryst	Chainman	3 00 per day	12 00		12 00
R. E. Gallavin	Chainman	3 00 per day	3 00		3 00
			\$1,269 50	\$5 34	\$1,274 84
Incidental Expenses.					
Postage				\$0 92	
Miscellaneous				140 61	
					141 53
Total					\$1,416 37

Washington Street Bridge, Rome.

Chapter 522, Laws of 1910.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
E. M. Weiskotten	Draftsman	\$4 00 per day	\$104 00		\$104 00

Dominick Street Bridge, Rome.

Chapter 877, Laws of 1911.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
E. A. Brainard	Bridge designer	\$175 per month	\$175 00		\$175 00
E. G. Semon	Bridge designer	175 per month	44 35		44 35
L. H. Freedman	Bridge draftsman	125 per month	4 03		4 03
I. S. Abrahams	Bridge draftsman	125 per month	125 00		125 00
A. W. Conner	Bridge draftsman	125 per month	45 42		45 52
C. F. Hopstein	Engineering draftsman	5 00 per day	45 00		45 00
S. Cohen	Engineering draftsman	4 00 per day	268 00		268 00
L. C. West	Tracer	75 per month	225 00		225 00
J. F. Blaise	Tracer	50 per month	100 00		100 00
					\$1,031 80
Incidental Expenses.					
Stationery and printing				\$48 84	
					48 84
Total					\$1,080 64

Improvement of Weigh-Lock Building, Syracuse.

Chapter 524, Laws of 1910.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
Guy Moulton.....	First resident engineer.....	\$250 per month	\$100 00	.....	\$100 00
Carl F. Hopstein.....	Draftsman.....	5 00 per day	710 00	.....	710 00
Jerry J. Ryan.....	Tracer.....	75 per month	101 61	.....	101 61
					\$911 61
				<i>Incidental Expenses.</i>	
Stationery and printing.....				\$20 63	20 63
Total.....					\$932 24

Surveys for State Board of Claims.

Chapter 513, Laws of 1910; Chapter 811, Laws of 1911.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
Guy Moulton.....	First assistant engineer.....	\$250 per month	\$350 00	\$2 68	\$352 68
D. E. Whitford.....	Assistant engineer.....	6 00 per day	1,722 00	.....	1,722 00
R. K. Sheldon.....	Assistant engineer.....	6 00 per day	474 00	76 68	550 68
L. D. Brownell.....	Assistant engineer.....	6 00 per day	18 00	12 11	30 11
C. F. Hopstein.....	Draftsman.....	5 00 per day	110 00	26 23	136 23
E. M. Weiskotten.....	Draftsman.....	4 00 per day	76 00	.....	76 00
C. G. Lamphere.....	Draftsman.....	4 0 per day	8 00	.....	8 00
Jerry J. Ryan.....	Tracer.....	75 per month	192 31	4 44	196 75
M. J. Chryst.....	Chainman.....	3 00 per day	57 00	.....	57 00
F. C. Curtin.....	Chainman.....	3 00 per day	162 00	80	162 80
Harvey Wagner.....	Stenographer.....	125 per month	75 00	.....	75 00
Clark H. Norton.....	Laborer.....	2 00 per day	108 00	.....	108 00
L. C. Ryan.....	Laborer.....	2 00 per day	14 00	.....	14 00
			\$3,366 31	\$122 94	\$3,489 25
					<i>Incidental Expenses.</i>
Livery.....				\$10 00	.....
Miscellaneous.....				21 60	31 60
Total.....					\$3,520 85

Mapping Canal Lands.

Chapter 199, Laws of 1910.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
E. C. Olcott.....	Assistant engineer.....	\$6 00 per day	\$1,254 00	\$139 14	\$1,393 14
Samuel Cohen.....	Draftsman.....	4 00 per day	116 00	.....	116 00
Charles Montag.....	Rodman.....	3 50 per day	91 00	.....	91 00
A. A. Vickers.....	Chainman.....	3 00 per day	627 00	.....	627 00
John Shay.....	Boatman.....	3 00 per day	366 00	2 95	368 95
Earl Willis.....	Laborer.....	2 00 per day	418 00	.....	418 00
Clark H. Norton.....	Laborer.....	2 00 per day	54 00	.....	54 00
E. C. Taylor.....	Launch.....	.....	.....	126 00	126 00
			\$2,926 00	\$268 09	\$3,194 09
					<i>Incidental Expenses.</i>
Stationery and printing.....				\$0 60	.....
Postage.....				74	.....
Rent.....				10 00	.....
Telephone and telegraph.....				25	.....
Miscellaneous.....				45 51	57 10
Total.....					\$3,251 19

Surveys, Field Notes and Manuscript Maps.

Chapter 511, Laws of 1912.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
E. C. Olcott.....	Assistant engineer.....	\$6 00 per day.....	\$624 00.....	\$88 13.....	\$712 13.....
A. A. Vickers.....	Chainman.....	3 00 per day.....	39 00.....	.....	39 00.....
F. W. Kinney.....	Boatman.....	3 00 per day.....	268 50.....	.....	268 50.....
John Shay.....	Boatman.....	3 00 per day.....	.....	1 15.....	1 15.....
Earl M. Willis.....	Laborer.....	2 00 per day.....	208 00.....	.....	208 00.....
			\$1,139 50.....	\$89 28.....	\$1,228 78.....
Incidental Expenses.					
Postage.....				\$0 50.....	
Miscellaneous.....				41 25.....	
					41 75.....
Total.....					\$1,270 53.....

Black River Survey.

Chapter 190, Laws of 1911.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
Guy Moulton.....	First resident engineer.....	\$250 per month.....	\$100 00.....	.....	\$100 00.....
Louis A. Burns.....	Resident engineer.....	250 per month.....	1,504 42.....	\$562 30.....	2,066 72.....
W. J. Durkin.....	Assistant engineer.....	6 00 per day.....	480 00.....	.....	480 00.....
R. W. Smith.....	Leveler.....	4 50 per day.....	738 00.....	.....	738 00.....
Walter F. Shaw.....	Leveler.....	5 00 per day.....	80 00.....	.....	80 00.....
C. H. Adams.....	Leveler.....	4 50 per day.....	202 50.....	.....	202 50.....
E. M. Weiskotten.....	Draftsman.....	4 00 per day.....	216 00.....	.....	216 00.....
Charles M. Chuchrow.....	Rodman.....	3 50 per day.....	546 00.....	.....	546 00.....
Octave DeCarre.....	Rodman.....	3 50 per day.....	52 50.....	.....	52 50.....
James Conley.....	Rodman.....	3 50 per day.....	395 50.....	4 35.....	399 85.....
John C. Lewin.....	Rodman.....	4 00 per day.....	36 00.....	.....	36 00.....
L. H. Wright.....	Rodman.....	4 00 per day.....	192 00.....	.....	192 00.....
Philip J. Baron.....	Rodman.....	3 50 per day.....	252 00.....	.....	252 00.....
Joseph Wechsler.....	Rodman.....	3 50 per day.....	119 00.....	.....	119 00.....
H. W. Grow.....	Chainman.....	2 50 per day.....	410 00.....	.....	410 00.....
M. W. Booth.....	Chainman.....	2 50 per day.....	142 50.....	.....	142 50.....
Philip Schwartz.....	Chainman.....	2 50 per day.....	195 00.....	.....	195 00.....
William Smutsler.....	Chainman.....	2 50 per day.....	112 50.....	.....	112 50.....
James O. Fitzpatrick.....	Laborer.....	2 00 per day.....	234 00.....	.....	234 00.....
G. E. Cahill.....	Laborer.....	2 00 per day.....	294 00.....	.....	294 00.....
T. S. Burns.....	Laborer.....	2 00 per day.....	318 00.....	.....	318 00.....
Henry Coan.....	Laborer.....	2 00 per day.....	314 00.....	.....	314 00.....
Newell H. Heath.....	Gage reader.....	10 per month.....	107 00.....	.....	107 00.....
B. F. Wise.....	Gage reader.....	10 per month.....	107 00.....	.....	107 00.....
Una Marshall.....	Gage reader.....	10 per month.....	90 00.....	.....	90 00.....
			\$7,237 92.....	\$566 65.....	\$7,804 57.....
Incidental Expenses.					
Stationery and printing.....				\$7 38.....	
Livery.....				173 25.....	
Fuel and light.....				3 25.....	
Postage.....				10 75.....	
Office rent.....				118 83.....	
Telephone and telegraph.....				12 89.....	
Miscellaneous.....				465 13.....	
					791 48.....
Total.....					\$8,596 05.....

SUMMARY.

The foregoing tables are summarized as follows:

Ordinary Repairs to Canals.

1. Erie canal, chapter 810, Laws of 1911	\$9,012 16
2. Black River canal, chapter 810, Laws of 1911	237 84

Construction of Barge Canal.

3. Erie canal, chapter 147, Laws of 1903, and amendatory laws	169,252 95
4. Oswego canal, chapter 147, Laws of 1903, and amendatory laws	87,238 15
5. Cayuga and Seneca canal, chapter 391, Laws of 1909, and amendatory laws....	54,541 94

Special Work.

6. Franklin street bridge, Syracuse, chapter 453, Laws of 1909; chapter 527, Laws of 1910	1,416 37
7. Washington street bridge, Rome, chapter 522, Laws of 1910	104 00
8. Dominick street bridge, Rome, chapter 877, Laws of 1912	1,080 64
9. Improvement of Weigh-lock building, Syracuse, chapter 524, Laws of 1910	932 24

Special Surveys.

10. Surveys for State Board of Claims, chapter 513, Laws of 1910; chapter 811, Laws of 1911	3,520 85
11. Mapping canal lands, chapter 199, Laws of 1910	3,251 19
12. Surveys, field notes and manuscript maps, chapter 511, Laws of 1912	1,270 53
13. Black river survey, chapter 190, Laws of 1911	8,596 05
Total	\$340,454 91

TABLE OF CONTRACTS COMPLETED ON THE MIDDLE DIVISION DURING THE FISCAL YEAR ENDED
SEPTEMBER 30, 1912.
Special Work.

CONTRACTOR.	Date of contract.	Character of work.	ACT.		Appropriation.	Engineer's preliminary estimate.	Contract price.	Final payment.
			Chap.	Year.				
Charles B. Foster..... The O. M. Edwards Company.....	Dec. 3, 1910 Nov. 16, 1911	Franklin street bridge, Syracuse..... Weigh-lock building, Syracuse.....	527	1910	\$51,000 00	\$43,131 75	\$38,245 75	\$37,112 37
			524	1910	15,000 00	9,817 40	9,231 50	11,673 96

Special Work, Connected with Barge Canal Construction.

CONTRACTOR.	Date of contract.	Character of work.	ACT.		Engineer's preliminary estimate.	Contract price, as affected by alterations.	Final payment.
			Chap.	Year.			
Cunningham-Woodard Co..... Cunningham-Woodard Co.....	June 15, 1910 June 15, 1910	Highways adjacent to Delta reservoir..... Raising highway adjacent to contract No. 78, near Fulton.....	453	1909	.....	\$46,386 80	\$45,314 70
			13	1909	.....	15,419 90	16,733 56

Construction of Barge Canal.

Chapter 147, Laws of 1903, and amendatory laws.

CONTRACTOR.	Date of contract.	Character of work.	Engineer's preliminary estimate.	Contract price, as affected by alterations.	Final payment.
E. J. Doyle & Co.....	Dec. 8, 1910	- Concrete highway bridge	\$1,353 10	\$1,350 92	\$1,332 14
Penn Bridge Co.....	Jan. 7, 1910	- Lock-gates, etc., on con-	46,403 24	26,284 05	24,961 03
Kalk & Brown..	Nov. 3, 1911	- Moving cemetery from	3,190 50	7,560 00	7,526 25
Cunningham-Woodard Co ..	Aug 12, 1910	- Dike along Oswego river	55,154 00	49,025 95	50,068 19
Lupfer & Remick	Sept. 23, 1910	Contract No. 79, Oswego canal — Bridge street bridge at Oswego	39,735 00	37,480 00	33,979 58
Walter Bradley.....	Jan. 16, 1911	Contract No. 80, Oswego canal — Dam and bulkheads at Phoenix.	134,340 00	117,390 64	110,886 34

TABLE OF CONTRACTS PENDING ON THE MIDDLE DIVISION, SEPTEMBER 30, 1912.

Special Work.

CONTRACTOR.	Date of contract.	Character of work.	Act.		Engineer's preliminary estimate.	Contract price, as affected by alterations.	Payment to September 30, 1912.
			Chap.	Year.			
Lupfer & Remick.....	July 24, 1912	Constructing a highway bridge over Black River canal at East Dominick street, Rome.	877	1911	\$23,790 50	\$19,874 00	\$207 00

TABLE OF CONTRACTS PENDING ON THE MIDDLE DIVISION, SEPTEMBER 30, 1912—(Continued).
Special Work, Connected with Barge Canal Construction.

CONTRACTOR.	Date of contract	Character of work	ACT		Engineer's preliminary estimate	Contract price	Value of work done to September 30, 1912
			Chap	Year			
Henry P. Burgard	Jan 3, 1912	Road A, adjacent to contract No. 37	13	1909		\$4,629 00	\$4,401 00
Henry P. Burgard	Jan 3, 1912	Road B, adjacent to contract No. 37	13	1907		93,019 20	70,150 00
James Stewart & Co.	Aug 14, 1912	Ox creek highways, near Fulton	13	1909	\$73,000 00	90,228 50	3,500 00

Construction of the Barge Canal.

Chapter 147, Laws of 1903; Chapter 301, Laws of 1909; and amendatory laws.

CONTRACTOR	Date of contract	Character of work	Engineer's preliminary estimate	Contract price, as affected by alterations	Value of work done to September 30, 1912
James Stewart & Co.	Jan 20, 1912	Contract No. 13, Erie canal — Bridges on part of contract No. 12	\$395,285 00	\$317,597 00	\$239,900 00
McDermott Contracting Co.	June 7, 1906	Contract No. 13, Erie canal — Bridges on part of contract No. 12	1,149,998 00	1,200,019 00	608,360 00
The T. A. Gillespie Co.	Dec 14, 1911	Contract No. 13, Erie canal — Bridges on part of contract No. 12	103,058 00	174,513 90	88,000 00
Oswego Construction Co., Inc.	Mar. 4, 1912	Contract No. 13, Erie canal — Bridges on part of contract No. 12	515,044 00	516,336 00	76,240 00
James Stewart & Co.	Sept 23, 1907	Contract No. 13, Erie canal — Bridges on part of contract No. 12	3,082,560 00	3,558,145 84	2,508,510 00
Penn Bridge Co.	Nov 7, 1908	Contract No. 13, Erie canal — Bridges on part of contract No. 12	17,471 50	17,955 50	10,250 00
M. Fitzgerald	Sept. 24, 1910	Contract No. 22, Erie canal — Bridge at Weedsport	107,128 00	127,521 00	40,500 00
Lupfer & Remick	Aug 8, 1912	Contract No. 22-A, Erie canal — Bridge at Weedsport	24,916 00	27,099 20	0 0
Gilmour-Horton-Allen Co.	Sept. 16, 1907	Contract No. 35, Oswego canal — Through Oswego	752,760 00	760,917 20	641,250 00

Henry P. Burgard.....	Dec. 9, 1910	Contract No. 37, Oswego canal — Between Fulton and Oswego	1,992,220 00	2,462,608 70	1,137,930 00
James Stewart & Co.s.....	April 15, 1910	Contract No. 38, Oswego canal — Three River Point to Fulton	972,900 00	1,048,674 40	230,720 00
Stanley-Morrissey, Inc.s.....	July 9, 1909	Contract No. 42, Erie canal — Herkimer-Onesida county line to Oriskany road	1,312,814 00	1,047,365 06	478,670 00
M. A. Talbott Co	Oct. 15, 1909	Contract No. 43, Erie canal — Oriskany road to Mud creek	1,529,885 00	1,413,015 90	301,349 00
Scott Brothers	Jan. 8, 1910	Contract No. 44, Erie canal — Mud creek to contract No. 4	1,926,093 00	1,760,913 35	922,270 00
Kinner Construction Co.....	Nov. 23, 1908	Contract No. 46, Erie canal — Fox Ridge to Wayne county line	1,367,583 00	1,306,930 06	734,720 00
Buffalo Dredging Co.....	Sept. 23, 1910	Contract No. 50, Water-works — Dam across West Canada creek	1,076,000 00	971,708 00	233,890 00
Alto Construction Co.	Dec. 23, 1910	Contract	424,710 00	397,093 00	149,430 00
Arthur McMullen	Oct. 19, 1908	Contract No. 57, Erie canal — Through Onondaga lake outlet	1,014,525 00	945,839 55	883,250 00
New York State Dredging Co	Aug. 6, 1912	Contract No. 85, Oswego canal — Bridge over lock at Phoenix	85,626 00	92,596 00	0
Lupfer & Remick.....	Aug. 5, 1911	Contract No. 90, Erie and Oswego canals — Power-supply: Erie canal, lock No. 24, and Oswego canal, locks Nos. 1, 2, 7 and 8	12,783 50	13,150 50	12,010 00
D'Olier Engineering Co	April 12, 1910	Contract No. 90-A, Oswego canal — Power-plants at locks Nos. 1, 2, 7 and 8	96,536 36	88,006 41	80,960 00
Lupfer & Remick.....	Aug. 8, 1912	Contract No. 101, Erie canal — Bridge at Three Rivers	64,840 00	64,020 20	980 00
Barrally & Ingersoll	Aug. 8, 1912	Contract No. 104, Oswego canal — Bridge at Broadway, Fulton	44,599 50	40,639 50	3,300 00
R. B. Murdock	Mar. 5, 1912	Contract A, Cayuga and Seneca canal — Lock No. 1 and	45,580 00	39,370 00	560 00
Scott Brothers.....	Dec. 30, 1910	a canal — Dredging Seneca lake, Cayuga lake to Seneca	393,133 50	376,233 50	208,680 00
Crowell-Sherman-Stalter Co	Dec. 29, 1910	b canal — Dredging Cayuga	1,832,550 00	1,436,567 50	740,820 00
James H. Dawes	Dec. 22, 1911	canal — Improvement from	178,237 00	216,509 90	0
The Central Dredging Co	Sept. 23, 1912	.....	304,230 00	215,639 00	0

^a Suspended by order of Canal Board

^b Relet to complete former contracts.

EXTRA AND UNSPECIFIED WORK ORDERS PAID TO SEPTEMBER 30, 1912.

CONTRACT NO.	Date of order.	Amount.	Total.
4.....	Nov. 2, 1906	\$1,257 29	\$12,584 45
4.....	May 20, 1909	281 34	
4.....	June 4, 1909	399 22	
4.....	Aug. 3, 1909	7,635 64	
4.....	Nov. 18, 1909	62 65	
4.....	May 24, 1910	2,948 31	
7.....	June 9, 1908	\$49 50	3,216 85
7.....	Feb. 2, 1909	24 18	
7.....	May 10, 1909	3,143 17	
10.....	Oct. 21, 1907	\$166 00	2,019 10
10.....	Jan. 13, 1908	1,032 00	
10.....	April 24, 1908	.....
10.....	Feb. 1, 1911	821 10	
10-A.....	July 2, 1912	\$35 00	35 00
12.....	Jan. 23, 1909	\$328 51	328 51
33.....	July 14, 1911	\$302 13	302 13
35.....	Oct. 2, 1908	\$760 95	910 95
35.....	Sept. 20, 1910	150 00	
45.....	Dec. 15, 1908	\$68 71	866 88
45.....	Aug. 5, 1909	480 20	
45.....	Oct. 29, 1909	317 97	
50.....	Sept. 22, 1911	\$1,270 20	1,270 20
51.....	Aug. 9, 1912	\$816 00	816 00
53.....	April 18, 1911	\$236 38	1,113 14
53.....	May 3, 1911	876 76	
55.....	Dec. 29, 1910	\$405 30	1,662 96
55.....	Jan. 12, 1912	706 12	
55.....	May 20, 1912	362 69	
55.....	July 29, 1912	130 20	
55.....	July 30, 1912	58 65	
55-R.....	July 10, 1912	\$101 28	101 28
78.....	Sept. 3, 1910	\$51 10	51 10
79.....	Jan. 24, 1912	\$680 68	680 68
80.....	Dec. 6, 1911	\$209 15	209 15
90.....	June 15, 1911	\$562 42	1,200 14
90.....	Jan. 27, 1912	22 00	
90.....	Feb. 28, 1912	615 72	
Grand total.....	\$27,368 52

REPORT
OF THE
DIVISION ENGINEER
OF THE
WESTERN DIVISION

For the Fiscal Year Ended September 30, 1912

WESTERN DIVISION.

STATE OF NEW YORK,
DEPARTMENT OF STATE ENGINEER AND SURVEYOR,
WESTERN DIVISION.

ROCHESTER, N. Y., *October 1, 1912.*

Hon. JOHN A. BENSEL, *State Engineer and Surveyor, Albany,
N. Y.:*

Sir.—I have the honor of submitting herewith my annual report as Division Engineer of the Western Division, for the fiscal year ended September 30, 1912.

The Western Division includes the existing and proposed lines of all of the Erie canal lying west of the Wayne-Seneca county line.

The principal work of the division has been the construction of the Barge canal, but other operations herewith enumerated have also engaged the attention of the staff.

BOARD OF CLAIMS.

Many surveys, maps and reports have been undertaken and prepared for the Board of Claims in connection with cases of alleged damage on account of canal construction.

SPECIAL WORK.

REPAIRS TO OAK ORCHARD CREEK FEEDER.

(Chapter 547, Laws 1912.)

A survey has been made and plans and estimates prepared for repairing the dam and head-gates of the feeder leading from Tonawanda creek to Oak Orchard creek, for cleaning out and enlarging this feeder and widening and deepening the channel of Oak Orchard creek below its junction with the feeder.

DRAIN AT CHAPEL STREET, LOCKPORT.

(Chapter 397, Laws 1912.)

Plans and specifications have been prepared for building a drain from the culvert under the Erie canal at Chapel street, Lockport. The drain is designed to take care of the seepage from the canal in this vicinity.

BLUE LINE SURVEY.

(Chapter 511, Laws 1912.)

Under Chapter 199, Laws of 1910, no work was done in this Division. Since June, 1912, L. G. Fisher, Assistant Engineer, has been in charge of a party engaged in surveying, mapping and monumenting the right-of-way line, or "blue line," of the existing Erie canal in Monroe county and also of the Genesee feeder. The blue line has also been surveyed from Lyons to the eastern limits of the Division.

This work will be very much needed in order to facilitate the disposition of the State property, when the existing canals are abandoned, and I recommend an appropriation sufficient to complete these surveys if the amount now available proves inadequate.

BARGE CANAL.

(Chapter 147, Laws 1903, and amendments.)

The Barge canal work in this division is at present handled through four residency offices.

Residency No. 8 covers Wayne county. B. E. Failing, Resident Engineer, is in charge, with office at Lyons.

Residency No. 9 covers Monroe county. H. J. Knoppel, Supervising Engineer, is in charge, with office at Rochester.

Residency No. 10-A covers Orleans county. J. V. Hogan, Resident Engineer, is in charge, with headquarters at Medina.

Residences Nos. 10-B and 11 cover the territory west of Gasport. This residency was in charge of C. J. McDonough, Resident Engineer, until January 15, 1912, at which time he resigned to go with the Terminal Bureau. Edward Anderberg, Assistant

Engineer, was placed in charge upon the resignation of Mr. McDonough and acted in this capacity until August 12, 1912, when George C. Andrews, Resident Engineer, took charge of these residencies.

A large amount of construction work has been done on this Division during the last year. From the fact that the Barge canal is virtually an enlargement of the existing canal throughout much of the Division, the difficulty of avoiding interference with navigation is very great and a large portion of the construction has to be accomplished during cold weather and at very great disadvantage.

The following reports of the resident engineers give in detail the condition and progress of construction:

ERIE CANAL, RESIDENCY No. 8.

Resident Engineer B. E. Failing reports:

"Residency No. 8 embraces the entire length of the Barge canal through Wayne county and extends from the southerly line of the county, at the southeast corner of the town of Galen, to the westerly line, about one-half mile west of the village of Wayneport, Wayne county. The construction work on this residency is divided into eight contracts, viz., Nos. 47, 48, 49, 76, 77, 84, 89 and 94.

"Contract No. 47.

"This contract extends from the southeast corner of the town of Galen, Sta. 5729 + 79.28, to a point near the New York Central and Hudson River railroad crossing at Lyons, at Sta. 6510 + 00, a distance of 14.46 miles. D. E. Bellows, Assistant Engineer, is in charge.

"This contract was let to the Crowell-Sherman Company, of Cleveland, Ohio, on November 30, 1908, and assigned soon after to the Crowell-Sherman-Stalter Company. The contract calls for completion on or before May 20, 1912.

"The contract has been altered by supplementary agreements as follows:

"Alteration No. 1, approved by the Canal Board July 1, 1909, changes the cross-section of lock wall, conduits for electric wires and specifications for miter-sills. It also provides for joints and ball-valves in floor of lock and increases the amount of clearing on the contract.

"Alteration No. 3, approved by the Canal Board November 16, 1910, provides for the removal of the Glasgow street and Sodus street bridges at Clyde and the reërection on temporary foundations of the Sodus street bridge.

"Alteration No. 4, approved by the Canal Board December 27, 1910, provides for the changing the plans for the east end of the lower approach wall at lock No. 26.

"Construction work on this contract during the past year has been confined to the structures in the vicinity of lock No. 26. The upper approach, lower approach, lock No. 26 and the dam at lock No. 26 are completed, leaving only the cribs above the lock and the riprap at the West Shore railroad crossing to be built, to complete all the structures on the contract east of Creager's bridge.

"The following table shows the percentage of work done during the fiscal year and to date, as affected by all alterations:

ITEMS OF WORK.	Preliminary estimate, as affected by alterations.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Clearing.....acres	225	2	252	0.9	112
Grubbing.....cu. yds.	890	150	750	16.9	84.4
Excavation.....cu. yds.	5,310,950	31,350	3,160,608	0.6	59.6
Sheeting and bracing.....ft. B. M.	25,000	0	28,000	0	112
Forming embankment.....cu. yds.	31,950	7,372	19,221	23.1	60.3
Lining.....cu. yds.	1,120	0	0	0	0
Sawed lumber, yellow pine or Douglas fir, ft. B. M.	4,000	500	3,000	12.5	75
Sawed lumber, hemlock.....ft. B. M.	32,000	0	0	0	0
White oak in miter-sills.....ft. B. M.	7,000	6,800	6,800	97.2	97.2
Sawed lumber, white oak.....ft. B. M.	1,000	53	53	5.3	5.3
Round timber in cribs.....lin. ft.	320	0	0	0	0
Stone filling in cribs.....cu. yds.	410	0	0	0	0
Foundation piles.....lin. ft.	4,200	5,755	5,755	136.9	136.9
Mooring piles.....No.	8	8	8	100	100
Wooden sheet-piling.....ft. B. M.	7,000	0	5,000	0	71.5
Second-class concrete.....cu. yds.	23,689	11,148	22,019	47.1	93
Reinforced concrete.....cu. yds.	113	0.7	107.7	0.6	95.4
First-class masonry, bridge coping....cu. yds.	2	0	1.65	0	82.6

BARUE CANAL, CONTRACT NO. 47
Lock No. 26 and dam in Clyde river, near Clyde.

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ITEMS OF WORK.	Preliminary estimate, as affected by alterations.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Second-class stone paving.....sq. yds.	50	1.7	37.7	3.4	75.5
Second-class riprap.....cu. yds.	860	0	11	0	1.3
15-in. vitrified pipe.....lin. ft.	865	151	937	17.5	108.2
Trenching and backfilling.....lin. ft.	865	147	933	17	107.8
Structural steel.....lbs.	158,100	4,271	145,312	2.7	91.8
Metal reinforcement.....lbs.	24,500	8,728	24,644	3.6	100.6
Wrought iron.....lbs.	2,425	1,226	1,927	50.5	79.5
Steel castings.....lbs.	10,400	9,918	9,918	95.3	95.3
Iron castings, plain.....lbs.	6,290	4,434	4,434	70.5	70.5
Iron castings, machined.....lbs.	6,600	3,240	6,420	49.1	98.8
Woolen pavement.....sq. yds.	330	0	322	0	97.7
Woolen fence.....lin. ft.	925	0	0	0	0
Wrought iron pipe railing.....lin. ft.	470	445	445	94.7	94.7
Sawed lumber in needles.....ft. B. M.	14,000	12,900	12,900	92.2	92.2
Metal in lock-valves.....lbs.	24,000	22,487	22,487	93.7	93.7
Metal in buffer-beams.....lbs.	90,000	75,840	80,526	84.4	89.5
Metal in lock-gates.....lbs.	180,000	169,182	169,481	94.1	94.2
Maintaining highway traffic.....lump sum	1	0	0	0	0
Coffer-dams.....lump sum	1	1	1	100	100
Removing Glasgow st. and Sodus st. bridges, etc.....lump sum	1	0	1	0	100
Gross estimate.....	\$1,279,327.60	\$110,260	\$830,850	8.8	65

“ Contract No. 84.

“ This contract consists of the construction of two lift bridges across the Barge canal at Glasgow and Sodus streets, Clyde. The work on the plans has been suspended, pending an investigation of a scheme for the elimination of the grade crossings of the New York Central and West Shore railroads at that point.

“ Contract No. 48.

“ This contract extends from a point near the New York Central and Hudson River railroad crossing at Lyons, Sta. 6510, to a point near the West Shore railroad crossing at East Newark, Sta. 6813, a distance of 5.75 miles. F. W. Madigan, Assistant Engineer, is in charge.

“ This contract has been altered by supplementary agreements as follows:

“ Alteration No. 1, approved by the Canal Board July 19, 1911, provides for a change in the manner of removal of buildings from the site of the contract.

“ Alteration No. 2, approved by the Canal Board January 31, 1912, provides for eliminating embankment on the south side of the canal from Sta. 6649 to Sta. 6678; for sheet-piling under em-

bankment on the north side of canal from Sta. 6657 to Sta. 6666 and for shortening the lower approach wall at lock No. 28-A.

"Alteration No. 3, approved by the Canal Board June 11, 1912, provides for changing the plans for power plant at lock No. 27.

"Alteration No. 4, approved by the Canal Board September 10, 1912, provides for sheet-piling under the embankment on the south side above lock No. 28-A.

"This contract was let December 29, 1910, to the Crowell-Sherman-Stalter Company. The contract calls for completion on or before January 1, 1914.

"The suction-dredge *Lyons* started work on October 24, 1911, at the easterly end of the contract. Except for a few days' work on contract No. 47, the *Lyons* continued work on contract No. 48 until she had finished all the hydraulic work available on the contract. On September 16, 1912, she tied up at the east end of the contract, having taken out about 900,000 cubic yards of excavation, most of which was prism excavation. The dipper-dredge *Erie* was completed and started work on March 11, 1912. The *Erie* was used on the easterly portion of the contract to loosen the hard material, which was afterward removed by the suction dredge. She completed her work and tied up about October 1. Both dredges are now being overhauled and repaired.

"The retaining wall on the south side at Geneva street, Lyons, and the abutments of the Geneva street bridge are finished. The steel work for the bridge is complete and there remains only the flooring to complete the structure.

"The north lower approach wall of lock No. 27 has been started and is progressing rapidly, being about 50 per cent completed.

"Under an extra or unspecified work order, dated August 8, 1912, a stream entrance of sheet-piling and riprap was placed near Sta. 6615, where Trout run enters the canal.

"The upper and lower approach walls of lock No. 28-A are completed. The south wall at lock No. 28-A is complete and work has started on the north wall. No work has been done on the floor.

"Under alteration No. 2 all of the sheet-piling has been driven for embankment on the north side. This, except for the waling strips, is ready for the embankment.

"The prism is complete between Stas. 6682 and 6734, with the exception of about 50 per cent of the wash wall.

"The Poorhouse bridge, spillway and dive culvert are practically completed.

"Pending the passage of plans for a highway at Burleigh's, an extra work order was issued for maintenance of traffic at that point. Subsequently a contract was let to the Crowell-Sherman-Stalter Company for the construction of this road, which is about 50 per cent completed.

"A Browning excavator, working west of the New York Central crossing, has taken out about 60,000 cubic yards of prism excavation.

"The following table shows the percentage of work done during the fiscal year and to date, as affected by all alterations:

ITEMS OF WORK.	Preliminary estimate, as affected by alterations.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Clearing.....acres	67	10	50	14.9	74.7
Excavation.....cu. yds.	1,992,600	1,124,560	1,204,825	56.5	60.5
Sheeting and bracing, first-quality...ft. B. M.	193,000	77,900	92,900	40.3	47.1
Sheeting and bracing, second-quality.ft. B. M.	229,000	22,200	22,200	9.7	9.7
Forming embankment.....cu. yds.	229,707.33	59,584	103,564	26	47.8
Lining.....cu. yds.	690	254	254	36.8	36.8
Puddle.....cu. yds.	950	190	190	20	20
Sawed lumber, yellow pine or Douglas fir, ft. B. M.	30,800	1,900	1,900	6.2	6.2
Foundation piles.....lin. ft.	32,260	12,252	12,292	38	38.1
Wooden sheet-piling.....ft. B. M.	306,000	82,740	82,740	27	27
Second-class concrete.....cu. yds.	57,910	18,869	21,129	32.6	36.5
Reinforced concrete.....cu. yds.	702	208	208	29.6	29.6
First-class masonry, bridge coping....cu. yds.	4.7	4.55	4.55	96.8	96.8
Wash wall.....cu. yds.	27,270	3,918	3,918	14.4	14.4
First-class stone paving.....sq. yds.	80	7.7	7.7	9.6	9.6
Second-class stone paving.....sq. yds.	2,320	369	369	15.9	15.9
Steel sheet-piling, first-quality.....sq. ft.	24,000	20,496	32,986	85.5	137.3
Steel sheet-piling, second-quality.....sq. ft.	120,000	19,637	19,637	16.4	16.4
Structural steel.....lbs.	396,410	340,178	340,178	85.9	85.9
Metal reinforcement.....lbs.	89,980	25,235	25,235	28.1	28.1
Wrought iron.....lbs.	4,400	300	300	14.9	14.9
Steel castings.....lbs.	3,300	1,550	1,550	47	47
Iron castings, plain.....lbs.	24,330	325	325	1.3	1.3
Iron castings, machined.....lbs.	23,240	4,150	4,150	17.8	17.8
Stone curbs.....lin. ft.	160	71	71	44.4	44.4
Resetting stone curbs.....lin. ft.	270	215	215	79.6	79.6
Relaying Medina sandstone pavement, sq. yds.	400	180	180	45	45
Wooden pavement.....sq. yds.	280	264	264	94.4	94.4
Wooden fence.....lin. ft.	1,240	1,401	1,401	113	113
Lattice railing.....lin. ft.	320	312	312	97.6	97.6
Metal in lock-gates.....lbs.	438,000	306	306	0.1	0.1
Metal in buffer-beams.....lbs.	173,000	6,028	6,028	34.8	34.8
Metal in lock-valves.....lbs.	68,500	442	442	0.6	0.6
Maintaining highway traffic.....lump sum	1	35 ^c / ₁₀	50 ^c / ₁₀	35	50
Maintaining navigation.....lump sum	1	30 ^c / ₁₀	30 ^c / ₁₀	30	30
Coffer-dams, pumping, etc.....lump sum	1	20 ^c / ₁₀	22 ^c / ₁₀	20	22
Gross estimate.....	\$1,679,211.95	\$759,170	\$835,140	45.2	49.7

“ Contract No. 89.

“ This contract covers the superstructures for the bridges at Limerick street, Palmyra, contract No. 77; Main street and East avenue, Newark, and below lock No. 28-B, contract No. 76, and the superstructures, abutments and approaches for the bridge at Forgham street, Lyons, contract No. 48.

“ The contract was let May 28, 1912, to the Owego Bridge Company, of Owego, N. Y., and calls for completion on or before June 1, 1913.

“ The engineering work is being handled by the assistant engineers in charge of the contracts adjacent to the several structures.

“ Work was started on the abutments for the Forgham street bridge on September 19, 1912, but very little has been done.

“ Contract No. 76.

“ This contract extends from a point near the West Shore railroad crossing at East Newark, Sta. 6813, to a point about half a mile east of Port Gibson, Sta. 7045, a distance of 5.77 miles.

“ This contract has been altered by the following supplementary agreements:

“ Alteration No. 1, approved by the Canal Board April 26, 1911, provides for a change in the manner of removing buildings from the site of the contract.

“ Alteration No. 2, approved by the Canal Board June 8, 1911, provides for a change in the plans for lower approach walls of lock No. 28-B.

“ Alteration No. 3, approved by the Canal Board July 19, 1911, provides for wooden sheet-piling under the north embankment between Stas. 6998 + 33.5 and 7045 + 00.

“ C. D. Murray, Assistant Engineer, is in charge of construction. The contract calls for completion on December 23, 1913.

“ Work has been progressing rapidly and will probably be completed before the time specified. The lower approach and lock No. 28-B, the dock walls, the north abutments to East avenue, Main street and Peek's bridges are completed; also the spillway.

BARGE CANAL, CONTRACT No. 76.

Construction of dock at Newark, between East avenue and Main street. View shows one of the approaches and the retaining wall between Van Buren street and the dock.

The sheet-piling under the embankment has been driven and about 68 per cent of the embankment made. One more season will finish the excavation on this contract and will be done by steam-shovels and a suction-dredge.

"The following table shows the percentage of work done during the fiscal year and to date, as affected by all alterations:

ITEMS OF WORK.	Preliminary estimate, as affected by alterations.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Excavation.....cu. yds.	2,137,990	591,051	1,102,450	27.6	51.7
Embankment.....cu. yds.	164,500	76,366	111,719	46.4	67.9
Lining.....cu. yds.	1,120	306	306	27.3	27.3
Sawed lumber, white oak.....ft. B. M.	7,000	5,400	5,400	77.2	77.2
Wooden sheet-piling.....ft. B. M.	479,400	271,000	420,000	56.6	87.7
Second-class concrete.....cu. yds.	36,550	12,538	24,172	34.4	66.2
10-in. vitrified pipe.....lin. ft.	560	98	98	17.5	17.5
Structural steel.....lbs.	39,100	11,810	15,538	30.2	39.8
Metal reinforcement.....lbs.	37,900	7,879	13,971	20.8	36.9
Iron castings, plain.....lbs.	18,100	596	1,236	3.3	6.8
Iron castings, machined.....lbs.	6,900	3,280	6,560	47.5	96
Wooden fence.....lin. ft.	3,170	250	250	7.9	7.9
Metal in lock-gates.....lbs.	198,000	185,460	185,460	93.7	93.7
Metal in buffer-beams.....lbs.	85,000	7,000	7,000	8.2	8.2
Metal in lock-valves.....lbs.	25,000	18,420	18,420	73.7	73.7
Maintaining navigation.....lump sum	1	75%	75%	75	75
Removing old bridge superstructures.....lump sum	1	33½%	33½%	33½	33.3
Coffer-dams, pumping, bailing and draining.....lump sum	1	35%	55%	35	55
Gross estimate.....	\$1,512,011.15	\$437,610	\$790,870	28.9	52.3

"Contract No. 77.

"This contract extends from a point one-half mile east of Port Gibson, Sta. 7045, to about one-half mile west of Palmyra, Sta. 7400, a distance of 6.78 miles. C. E. Elmendorf, Assistant Engineer, is in charge of the contract.

"The contract calls for completion on or before May 1, 1913, and has been altered by the following supplementary agreements:

"Alteration No. 1, approved by the Canal Board April 26, 1911, provides for a change in the manner of removing buildings from the site of the contract.

"Alteration No. 3, approved by the Canal Board July 19, 1911, provides for wooden sheet-piling under the north embankment from Sta. 7045 to Sta. 7105.

“Alteration No. 4, approved by the Canal Board July 31, 1912, provides for changes in plan for concrete slab approach for Gallo-way’s highway bridge.

“Alteration No. 5, approved by the Canal Board March 11, 1912, provides for changing side slopes of prism and for wooden sheet-piling under embankment at certain places.

“Alteration No. 6, approved by the Canal Board July 11, 1912. provides material for embankment and for riprap at the south approach to Port Gibson bridge.

“Work on this contract for the past year has progressed rap- idly. All of the concrete work is finished with the exception of the upper approach wall to lock No. 29, the power-house and stop- gate and these structures are 75 per cent completed. The steam- shovel work on the contract has been finished and the work of the suction-dredge, which is completing the excavation, will be finished before May of next year. All the steel work on the contract is finished with the exception of the stop-gate. The wash wall is being laid and will probably be finished about the middle of next season.

“The following table shows the percentage of work done during the fiscal year and to date, as affected by all alterations:

ITEMS OF WORK.	Preliminary estimate, as affected by altera- tions.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Clearing.....acres	70	29	50	41.4	71.5
Excavation.....cu. yds.	2,643,610	1,164,591	1,831,598	44.1	69.4
Sheeting and bracing.....ft. B. M.	44,000	68,000	74,200	156.8	168.6
Forming embankment.....cu. yds.	194,480	38,471	69,382	19.8	35.6
Lining.....cu. yds.	1,470	273.7	273.7	18.6	18.6
Sawed lumber, yellow pine.....ft. B. M.	24,000	4,812	4,812	20.2	20.2
Foundation piles.....lin. ft.	35,500	16,716	21,662	47.1	61.1
Wooden sheet-piling.....ft. B. M.	690,000	619,445	619,445	89.7	89.7
Second-class concrete.....cu. yds.	43,930	23,183.4	41,337.4	52.8	94.2
Reinforced concrete.....cu. yds.	383	306.5	346.9	80.1	90.7
Wash wall.....cu. yds.	47,500	4,917.6	4,917.6	103.5	103.5
First-class stone paving.....sq. yds.	70	63	63	90	90
Second-class stone paving.....sq. yds.	940	682.1	682.1	72.6	72.6
Second-class riprap.....cu. yds.	150	91.7	91.7	61.1	61.1
Third-class riprap.....cu. yds.	3,000	561.8	561.8	18.7	18.7
Structural steel.....lbs.	702,380	600,689	602,842	85.6	85.8
Metal reinforcement.....lbs.	54,000	42,350	47,422	78.4	87.8
Steel castings.....lbs.	3,300	205	3,065	6.2	92.9
Iron castings, plain.....lbs.	13,200	1,156	1,156	8.8	8.8
Iron castings, machined.....lbs.	8,600	8,300	8,300	96.6	96.6
3½-in. wooden pavement.....sq. yds.	2,230	771	771	34.7	34.7
Lattice railing.....lin. ft.	420	400	400	95.4	95.4
Metal in lock-gates.....lbs.	206,000	171,020	171,020	83.1	83.1
Metal in buffer-beams.....lbs.	86,000	69,167	69,167	80.4	80.4

BAROE CANAL, CONTRACT No. 17.

Construction of Galloway's bridge, which crosses canal and West Shore railroad. Present canal appears in the foreground.

ITEMS OF WORK.	Preliminary estimate, as affected by alterations.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Removing old bridge superstructures, lump sum	1	100%	100%	100	100
Maintaining highway traffic..... lump sum	1	60%	80%	60	80
Sluice-gates, 60 in. x 84 in., complete!..... No.	3	3	3	100	100
Maintaining navigation..... lump sum	1	75%	75%	75	75
Coffer-dams, pumping, etc..... lump sum	1	38.5%	86%	38.5	86
Gross estimate.....	\$1,701,807.55	\$763,670	\$1,176,270	44.8	69.2

“ Contract No. 49.

“ This contract extends from a point about 500 feet east of Yellow Mills bridge to the Wayne-Monroe county line, a distance of 6.8 miles. H. N. Metzger, Assistant Engineer, is in charge of construction.

“ This contract was let February 26, 1910, to the Bellew & Merritt Company, whose name was changed to the Merritt Construction Company on May 18, 1911. On October 5, 1911, this contract was assigned to the American Pipe and Construction Company, of Philadelphia, Pa.

“ The contract called for completion on or before May 1, 1912, but the time has been extended to May 1, 1913.

“ Contract No. 49 has been altered by the following supplementary agreements:

“Alteration No. 1 changes the south approach to Frear's bridge and the electrical equipment for lock No. 30.

“Alteration No. 2 eliminates the wash wall of lock No. 30.

“Alteration No. 3 provides for lining in front of Wayneport and Frear's bridge abutments.

“Alteration No. 4 provides for substituting spoil for embankment and sheet-piling from the upper end of the north upper approach wall of lock No. 30 to Sta. 7545 + 93.

“Alteration No. 5 provides for constructing the south approach to Frear's bridge as embankment.

“ The excavation on this contract has been handled by a suction-dredge and a scraper-machine during the past year. About six months' more work will finish the excavation on the contract. The structures have all been completed with the exception of the gates for the by-pass at lock No. 30. About 75 per cent of the wash

wall is laid. The contract will, in all probability, be completed in the spring of 1913.

“The following table shows the percentage of work done during the fiscal year and to date, as affected by all alterations:

ITEMS OF WORK.	Preliminary estimate, as affected by alterations.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Clearing.....acres	220	2	204	0.9	92.8
Excavation.....cu. yds.	1,546,500	507,970	1,019,361	32.8	60
Sheeting and bracing.....ft. B. M.	260,000	64,000	91,000	24.6	35
Forming embankment.....cu. yds.	31,850	18,366	18,366	57.7	57.7
Lining.....cu. yds.	5,700	2,461	2,470	43.2	43.4
Sawed lumber, yellow pine or Douglas fir ft. B. M.	20,600	15,000	17,000	72.9	82.6
White oak.....ft. B. M.	4,000	2,000	2,000	50	50
Foundation piles.....lin. ft.	18,400	5,629	11,939	30.6	65
Wooden sheet-piling.....ft. B. M.	1,520,000	75,000	1,537,000	4.9	101.1
Second-class concrete.....cu. yds.	31,250	15,054	26,504	48.1	84.8
Reinforced concrete.....cu. yds.	250	113	213	45.2	85.3
First-class masonry bridge coping.....cu. yds.	7.5	3	3	40	40
Wash wall.....cu. yds.	15,000	8,478	10,418	56.5	69.4
Second-class stone paving.....sq. yds.	840	107	150	15.7	22.1
Cobblestone paving.....sq. yds.	320	190	190	59.4	59.4
Structural steel.....lbs.	480,400	357,653	455,028	74.4	94.9
Metal reinforcement.....lbs.	28,400	18,499	25,389	65.2	89.4
Steel castings.....lbs.	16,000	3,264	3,264	20.4	20.4
Iron castings, plain.....lbs.	600	578	578	96.4	96.4
Iron castings, machined.....lbs.	9,000	8,136	8,136	90.4	90.4
Wooden pavement, 3½ in. thick.....sq. yds.	170	166	166	97.7	97.7
Wooden pavement, 2½ in. thick.....sq. yds.	960	651	914	67.8	96.3
Wooden fence.....lin. ft.	3,875	334	334	8.6	8.6
Lattice railing.....lin. ft.	82	45	45	54.9	54.9
Metal in lock-gates.....lbs.	206,000	193,740	193,740	94	94
Metal in buffer-beams.....lbs.	86,000	57,800	57,800	67.2	67.2
Metal in lock-valves.....lbs.	34,000	31,201	31,201	9.2	9.2
For removing old bridge superstructures lump sum	1	0	1	0	100
Maintaining highway traffic.....lump sum	1	28%	65%	28	65
Coffer-dams, pumping, bailing and draining lump sum	1	14%	21%	14	21
Maintaining navigation.....lump sum	1	97%	97%	97	97
Gross estimate.....	\$735,227.25	\$272,980	\$543,700	37.2	74

ERIE CANAL, RESIDENCY No. 9.

Supervising Engineer H. J. Knoppel reports:

“This residency includes the entire length of the Barge canal within Monroe county, a distance of approximately 40 miles, and is divided into the following contracts: Nos. 63, 38, 41, 23, 59, 21, 82, 6, 60 and 61 and portions of contracts Nos. 75, 105 and 106. Of these, contracts Nos. 38, 41 and 6 have been completed and final estimates rendered; No. 75 is completed, but final estimate has not been made. Contracts Nos. 60, 61 and 105 will probably be completed during the winter of 1912-1913, while contracts Nos. 59 and 106 have not yet been advertised.

BARGE CANAL. CONTRACT NO. 49.
Concrete slope protection at the north approach to the Macedon bridge.

“ Total amount under contract, including completed work, is \$9,615,749.73; total earned to September 30, 1912, \$6,714,555.56; total earned during the year, \$1,935,153.15. Percentage done to date is 69.84; during the year, 20.13.

“ In work other than construction, a considerable number of appropriation surveys have been made, chiefly for relocated highways adjacent to the canal. During the past summer a survey party spent about four months on a survey of the old ‘ Blue line ’ on a portion of the existing canal that will be abandoned when the new canal, as built under contracts Nos. 6, 21, 59 and 23, is put into commission. Daily gage readings have been taken of the water stage of the Genesee river at Elmwood avenue bridge.

“ Construction work has advanced very satisfactorily on most of the contracts as shown in the following reports.

“ *Contract No. 63.*

“ This contract provides for the improvement of the Erie canal from the west line of Wayne county to the east end of contract No. 23 at King’s Bend, a distance of 12.22 miles. C. R. Waters, Assistant Engineer, has been in charge.

“ The contract was let to H. S. Kerbaugh, Inc., of Philadelphia, Pa., on June 13, 1910.

“ A hydraulic dredge operated by electrical power has been in operation during the navigable season, widening and deepening the prism east of Fairport. The nature of the material encountered, however, cut down the output of this machine far below expectations. Considerable shale rock was found for several feet above grade and this material, together with numerous boulders and other obstructions, prevented rapid progress. A Lidgerwood excavator continued excavating in the prism till about February 1, when the excessive cold weather compelled a cessation of work till April 1, since which time it has been excavating the prism where the output could be used for adjacent embankment. A clam-shell bucket excavator of local construction worked about two-thirds of the time, excavating a new channel for Thomas creek and also portions of the prism where the excavation could be conveniently handled with that machine. Several traveling derricks have been

used to excavate the prism proper and at the Irondequoit concrete trough, to excavate for the trough and backfill behind the walls.

" During the navigable season one steam-shovel worked part of the time in borrow pit, to obtain material for bridge approaches, and also in a portion of the new prism that is outside of the existing canal. During the closed season, from three to five steam-shovels excavated in the prism such material as could not well be handled with the hydraulic dredge, either on account of its consistency or of its location with reference to spoil banks.

" The construction of the concrete trough at Irondequoit creek crossing has been especially interesting as an example of monolithic concrete work. The necessity of completing the maximum amount possible between November 15 and the following May 15 was the reason for assembling a plant consisting of a 70-ton steam-shovel to excavate gravel, a crusher and screens and two-batch mixer for the concrete and two traveling derricks with standard-gage locomotives and 30-foot flat cars to transport and handle the concrete, together with four sets of collapsible steel forms for building 32-foot sections of wall.

" Because of the fact that the past winter was the severest of recent years, the record of 39,800 cubic yards of concrete placed by the above plant between November 15 and May 15 and of 15,900 cubic yards between April 1 and May 15 is worthy of commendation.

" Of the eight culverts on this contract, seven are completed. Eight bridges are completed, with substructures for two more ready for steel work. One waste-weir is completed. The substructure and superstructure for one guard-gate is completed and another gate is 60 per cent done. The Pittsford dock wall is completed and that at Fairport about 25 per cent done. The Irondequoit trough is practically completed.

" On September 3, 1912, at about 9 o'clock in the morning, a serious break occurred in a portion of the Irondequoit trough, when about 540 feet of trough and the embankment supporting it were washed out. The break was temporarily repaired by refilling the washed-out embankment and constructing a timber flume, 22 feet wide and 7 feet deep, supported by piles driven into the new fill.

BARGE CANAL, CONTRACT NO. 63.

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Knapp's bridge, near Fairport, crossing canal and West Shore and New York Central railroads.

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“ The following table shows the amounts and percentages of work done during the year and total done to end of fiscal year:

ITEMS OF WORK.	Preliminary estimate, as affected by alterations.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Coffer-dams, pumping, bailing and draining	miles 12.22	3.88	9.65	31.8	79
Clearing.....	lump sum \$1,000	\$250	\$950	25	95
Excavation.....	cu. yds. 2,813,185	749,364	1,680,449	26.6	59.7
Sheeting and bracing.....	ft. B. M. *98,000	12,486	57,405	12.7	58.6
Round timber bracing.....	lin. ft. 500	0	0	0	0
Channeling.....	sq. ft. 20,000	0	0	0	0
Forming embankment.....	cu. yds. 357,955	142,410	305,806	39.8	85.4
Lining.....	cu. yds. 31,988	4,080	9,298	12.8	29.0
Puddle.....	cu. yds. 21,290	19,688	19,741	92.5	92.7
Sawed lumber, yellow pine or Douglas fir	ft. B. M. 135,000	70,012	81,193	51.9	60.1
Creosoted lumber.....	ft. B. M. 22,000	22,000	22,000	100	100
Foundation piles.....	lin. ft. 17,690	7,232	7,913	40.9	44.7
Wooden sheet-piling.....	ft. B. M. 43,000	10,000	10,000	23.3	23.3
Second-class concrete.....	cu. yds. 93,743	45,965	66,900	49	71.4
Third-class concrete.....	cu. yds. 2,029	727	1,662	35.8	81.9
Reinforced concrete.....	cu. yds. 2,276	851	1,111.5	37.4	48.8
First-class masonry bridge coping.....	cu. yds. 31	9.5	13.3	30.6	42.9
Wash wall.....	cu. yds. 71,396	4,642	14,147	6.5	19.8
Second-class stone paving.....	sq. yds. 10,137	241	4,568	23.8	45.1
Third-class stone paving.....	sq. yds. 2,048	3	21	0.2	1
Cobblestone paving.....	sq. yds. *1,786	996	1,062	55.8	59.5
Second-class riprap.....	cu. yds. 22	0	0	0	0
Third-class riprap.....	cu. yds. 250	146	146	58.4	58.4
Fourth-class riprap.....	cu. yds. 7,930	6,023	6,023	76	76
Cast iron culvert pipe and specials.....	lbs. 1,093,563	339,419	1,068,161	31	97.7
Structural steel.....	lbs. 2,620,465	998,492	1,378,152	38.1	52.6
Metal reinforcement.....	lbs. 683,644	405,517	435,317	59.3	63.7
Iron castings, plain.....	lbs. 16,500	4,657	4,657	28.2	28.2
Expanded metal.....	lbs. 5,700	5,176	5,176	90.8	90.8
Portland cement sidewalk.....	sq. ft. *8,550	2,316	2,316	27.1	27.1
Relaying flag sidewalk.....	sq. yds. 45	0	0	0	0
Wooden pavement, 2½ in. thick.....	sq. yds. 818	537	804	65.6	98.3
Wooden pavement, 3½ in. thick.....	sq. yds. 964	202	611	21	63.4
Wooden block pavement.....	sq. yds. 500	500	500	100	100
Wooden fence.....	lin. ft. 10,935	5,027	5,027	46	46
Wrought iron pipe railing.....	lin. ft. 986	119.5	278.5	12.1	28.2
Lattice railing.....	lin. ft. 2,146	792	1,177	36.9	54.9
Repointing old masonry.....	lin. ft. 11,281	0	0	0	0
Drilling bolt holes in rock.....	lin. ft. 107	12	12	11.2	11.2
Resetting pipe railing.....	lin. ft. 230	0	0	0	0
Sluice-gates, 36 in. x 36 in.....	No. 3	0	3	0	100
Sluice-gates, 24 in. x 24 in.....	No. 4	0	0	0	0
Sluice-gate, 24 in. in diameter.....	No. 1	1	1	100	100
Metal in guard-gates.....	lbs. 465,000	300,000	300,000	64.5	64.5
Machinery for lift bridge.....	lbs. 52,000	0	0	0	0
Electrical equipment.....	No. 1	0	0	0	0
Operator's cabin.....	No. 1	0	0	0	0
Pump.....	No. 1	0	0	0	0
Tar felt waterproofing.....	sq. ft. 621,300	356,111	356,111	57.3	57.3
Removing old bridge superstructure.....	lump sum \$2,500	\$1,000	\$1,000	40	40
Maintaining navigation.....	lump sum \$12,000	\$4,920	\$7,200	41	60
Maintaining highway traffic.....	lump sum \$8,000	\$1,880	\$5,200	23.5	65
Sand filling.....	cu. yds. 11,200	3,986	3,986	35.6	35.6
Taking up and relaying bridge pavement	sq. yds. 220	0	0	0	0
Pumping, bailing, etc., alteration No. 4,	lump sum \$250	0	0	0	0
Sawed lumber, hemlock.....	ft. B. M. *170,000	156,800	156,800	92.2	92.2
Gross estimate.....	\$2,357,421.46	\$829,964.87	\$1,421,191.57	35.2	60.3
Extra Work Orders.					
Dated May 23, 1911.....	cost + 15%	.....	\$173,267.19	.....	Finished
Dated July 27, 1911.....	cost + 15%	.....	\$10,598.67	.....	Finished
Dated March 11, 1912.....	cost + 15%	.....	.....	.....	.....
Dated Sept. 6, 1912.....	cost + 15%	.....	.....	.....	.....
Dated Sept. 19, 1912.....	cost + 15%	\$3,000.00	.....	.....	.....
Dated Sept. 23, 1912.....	unit prices \$523.80	.....	.....	.....	.....

* Includes authorized increase over 15 per cent.

" Contract No. 38.

" This contract provided for the construction of the superstructure, substructure and approaches for a highway bridge at Wappings, 2.5 miles west of Fairport.

" The work of this contract was performed by Henry Tosh and Sons, of Port Byron, N. Y., and has been completed since August, 1909, the contract price being \$16,669.90 and the final estimate, \$16,286.67.

" Contract No. 41.

" This contract provided for building embankments at Irondequoit creek crossing. Butler Brothers Construction Company, of New York city, were the contractors, and work was completed in March, 1911, the contract price being \$274,917.50 and the final estimate, \$241,644.

" Contract No. 23.

" This contract provides for the construction of a land line from King's Bend to the Genesee river, a distance of 5.63 miles. H. R. Wickham, Assistant Engineer, is in charge.

" This contract was let to the Millard and Lupton Company, of Philadelphia, Pa., on August 18, 1909.

" Good progress has been made during the past year. The concrete work at lock No. 32 and adjoining structures has been completed, together with a large portion of the stone protection work. The filling back of the lock and guide walls has been made; the north dike wall built; also the embankment joining the upper spillway with the prism bank to the westward. Lock-gates, valves and buffer-beams, however, are not in place. At lock No. 33 and adjoining structures, all concrete work is completed except one block in the upper guide wall, which has been left open for the passage of dirt trains.

" In prism excavation from two to four 70-ton steam-shovels have been working all the time, save from February 1 to about May 1, when extreme cold or an excessive amount of ground water prevented economical work. Most of the prism excavation from lock No. 33 easterly has been completed, as well as most of the cut from Westfall road easterly to the beginning of the em-

Outlet of by-pass culvert at lock No. 33, near Rochester. The water emerges through the two 3-foot pipes and its fall is broken by the heavy riprap. The view shows also a concrete foot bridge.

bankment section of prism. The sides of the prism in the deep cut, where left on a 1 on 1½ slope, began to slide in. To prevent these slides, it was deemed best to cut these slopes to a series of bermes about 20 feet wide and 8 to 10 feet between benches. This is now being done on the slopes between East Henrietta road and Westfall road, where the material seems to be rather treacherous. About a third of the material excavated during the year has been placed in the prism embankments, mostly east of Clinton avenue, bringing these high banks nearly to their full sections. The building of wash wall is well under way and will be pushed from now on. Five of the six bridges on this contract have been completed.

“Excavation on the west end of the contract and work on the guard-lock have been delayed by complications at the crossings of the Erie and Lehigh Valley railways.

“The plant used on this contract is about the same as previously reported, except that from time to time plant has been shipped from the site. The cableway, with movable tower, forming a part of the concrete plant at lock No. 32, was abandoned when that lock was completed and the concrete buckets at lock No. 33 were handled by narrow-gage, 18-ton locomotives and flat cars in conjunction with traveling derricks, resulting in greater latitude in the operations, and the cost of handling is slightly lower.

“The following table shows the amounts and percentages of work done during the year and total done to end of fiscal year:

ITEMS OF WORK.	Preliminary estimate, as affected by alterations.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Coffer-dams, pumping, etc. lump sum	\$9,000	\$1,777.50	\$4,477.50	19.75	49.75
Clearing. lump sum	\$600	0	\$492	0	82
Grubbing. cu. yds.	*45,200	0	41,350	0	91.5
Excavation. cu. yds.	2,935,870	484,609	1,811,225	16.5	61.7
Round timber bracing. lin. ft.	3,000	0	0	0	0
Sheeting and bracing. ft. B. M.	300,000	32,245	34,857	10.7	11.6
Forming embankment. cu. yds.	1,096,390	173,036	811,389	15.8	74
Lining. cu. yds.	4,560	973	1,633	21.3	35.8
Sawed lumber, yellow pine or Douglas fir. ft. B. M.	105,000	47,180	47,180	44.9	44.9
White oak lumber. ft. B. M.	16,000	1,188	2,376	7.4	14.8
Sawed lumber in needles. ft. B. M.	13,000	0	0	0	0
Foundation piles. lin. ft.	68,145	2,621	3,934	3.8	5.8
Wooden sheet-piling. ft. B. M.	75,100	33,660	33,660	44.8	44.8
Steel sheet-piling. sq. ft.	4,500	1,156	1,156	25.7	25.7
Second-class concrete. cu. yds.	80,985	25,778	61,743	31.8	76.2
Second-class reinforced concrete. cu. yds.	770	516	708	67	92
First-class masonry coping. cu. yds.	14	6	6	42.9	42.9
Dry retaining wall. cu. yds.	39,400	0	0	0	0

ITEMS OF WORK.	Preliminary estimate, as affected by alterations.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Wash wall.....cu. yds.	38,200	1,769	1,769	4.6	4.6
Second-class stone paving.....sq. yds.	280	0	0	0	0
Third-class stone paving.....sq. yds.	3,380	0	0	0	0
First-class riprap.....cu. yds.	200	0	0	0	0
Second-class riprap.....cu. yds.	810	142	142	17.5	17.5
Third-class riprap.....cu. yds.	770	235	235	30.5	30.5
Fourth-class riprap.....cu. yds.	5,210	545	598	10.5	11.5
Grouted riprap.....cu. yds.	1,125	0	0	0	0
Cast iron pipe and specials.....lbs.	43,600	45,130	45,130	103.5	103.5
Structural steel.....lbs.	920,000	575,785	588,527	62.6	64
Metal reinforcement.....lbs.	362,700	72,840	277,470	20.1	76.5
Iron castings, plain.....lbs.	97,800	17,855	25,321	18.3	25.9
Iron castings, machined.....lbs.	39,880	13,612	28,207	34.1	70.7
Metal in guard-lock gates.....lbs.	425,000	0	0	0	0
Metal in buffer-beams.....lbs.	170,000	8,182	8,876	4.8	5.2
Metal in lock-gates.....lbs.	525,600	10,697	23,974	2	4.6
Metal in lock-valves.....lbs.	140,000	72	506	0.05	0.4
Brick lining.....cu. ft.	17,400	3,458	6,347	19.9	36.5
Wooden pavement, 2½ inches thick.....sq. yds.	930	762	762	81.9	81.9
Wooden fence.....lin. ft.	12,800	1,434	1,434	11.2	11.2
Wrought iron pipe railing.....lin. ft.	230	0	0	0	0
Lattice railing.....lin. ft.	1,100	451	451	41	41
Storehouses.....No.	3	0	0	0	0
Office buildings.....No.	3	0	3	0	100
Gate hoists, light.....No.	2	0	0	0	0
Gate hoists, heavy.....No.	2	0	0	0	0
Maintaining highway traffic.....lump sum	\$2,000	\$300	\$1,300	15	68
Gross estimate.....	*\$1,827,888.60	\$363,904.65	\$1,024,287.57	19.9	56
Extra Work Order.					
Dated Jan. 16, 1912.....cost + 15%			\$601.45	Finished	

* Includes authorized increase over 15 per cent.

“ Contract No. 21.

“ This contract provides for excavating the canal prism and constructing guard-lock, highway bridge abutments and all appertaining work between the Genesee river and the east end of contract No. 6, a distance of 2.43 miles. H. J. Hemstreet and Gordon Edson, Assistant Engineers, have been in charge at different times.

“ Contract No. 21 was let to Lane Brothers Company, of Alta-vista, Va., April 7, 1910.

“ Two steam-shovels continued excavation in the prism during the past year, excepting from February 1 to April 10, when extremely cold weather and an excessive amount of water in the cut prevented efficient work. The material excavated was largely rock, requiring constant blasting and channeling. For the former, fourteen steam-drills were kept in operation practically all the time and for the latter, channeling machines up to five in number were operated during the greater portion of the time.

BARGE CANAL, CONTRACT NO. 23.
Spillway at lock No. 33, near Rochester; also foundation and outlet for
power house.

BARGE CANAL, CONTRACT NO. 23.
Culvert under Edgewood avenue and lower drop of spillway at lock No. 33.

“Concrete abutments for two highway bridges have been completed and about 70 per cent of the concrete in the guard-lock is in place. The concrete on this contract is made of stone from prism excavation, crushed near the mixer, and sand brought in by rail from a gravel pit about 10 miles to the southward. The result is a very dense concrete.

“Continual pumping of the prism is necessary, as there is no natural outlet for the water, and for this purpose several electrically driven pumps have been installed at convenient locations and operated as necessity required.

“At the Buffalo, Rochester and Pittsburg railway crossing the new bridge is nearly completed, but nothing has been done as yet at the New York Central crossings.

“The following table shows the amounts and percentages of work done during the year and the total done to end of fiscal year:

ITEMS OF WORK.	Preliminary estimate.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Clearing.....lump sum	\$250	\$25	\$125	10	50
Excavation.....cu. yds.	2,350,000	510,880	1,467,242	21.7	62.4
Sheeting and bracing.....ft. B. M.	16,000	450	450	2.8	2.8
Channeling.....sq. ft.	390,000	48,991	64,673	12.6	16.6
Forming embankment.....cu. yds.	100	0	0	0	0
Lining.....cu. yds.	560	25	25	4.5	4.5
Sawed lumber.....ft. B. M.	3,000	0	0	0	0
Second-class concrete.....cu. yds.	6,400	2,507	3,204	39.2	50.1
Dry retaining wall.....cu. yds.	2,200	0	0	0	0
Rock spoil protection.....cu. yds.	8,000	0	0	0	0
Wash wall.....cu. yds.	8,000	0	0	0	0
Cobblestone paving.....sq. yds.	400	85	85	21.2	21.2
Third-class riprap.....cu. yds.	100	0	0	0	0
Fourth-class riprap.....cu. yds.	100	0	0	0	0
12-inch vitrified pipe, laid.....lin. ft.	27	0	0	0	0
Structural steel.....lbs.	2,400	642	642	26.8	26.8
Metal reinforcement.....lbs.	9,000	640	4,587	7.1	51
Iron castings, plain.....lbs.	12,600	0	0	0	0
Wooden fences.....lin. ft.	310	0	0	0	0
Metal in guard-gates.....lbs.	448,000	0	0	0	0
Drilling bolt holes in rock.....lin. ft.	1,000	0	0	0	0
Maintaining traffic.....lump sum	\$2,000	\$220	\$1,320	11	66
Coffer-dams, pumping, etc.....lump sum	\$4,000	\$880	\$2,280	22	57
Gross estimate.....	\$1,323,150	\$276,469.75	\$751,058.87	20.9	56.8

“Contract No. 82.

“This contract provides for constructing three new bridge superstructures within the limits of contract No. 21. H. J. Hemstreet and Gordon Edson, Assistant Engineers, have been in charge at different times.

“ This contract was let to the Groton Bridge Company, Groton, N. Y., on December 7, 1910, but its completion depends on the completion of the substructures by the contractors under contract No. 21.

“ During the past year two of the bridges have been completed and opened to traffic.

“ The following table shows the amounts and percentages of work done during the year and total done to end of fiscal year:

ITEMS OF WORK.	Preliminary estimate.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Structural steel. lbs.	475,000	190,642	347,471	40.1	73.2
Sawed lumber, yellow pine or Douglas fir, ft. B. M.	11,000	3,973	7,876	36.1	71.6
Wooden pavement, 3½ in. thick sq. yds.	1,425	1,060	1,060	74.4	74.4
Lattice railing lin. ft.	560	208	521	37.1	93
Gross estimate.	\$25,841.50	\$12,988.79	\$21,326.12	45.1	73.9

“ *Contract No. 6.*

“ This contract provided for the excavation of the canal from the New York Central and Hudson River railroad (west end of contract No. 21) to a point near South Greece, a distance of 3.28 miles.

“ This contract was let to F. A. Maselli, of Rochester, N. Y., on May 5, 1905, and was completed in September, 1911, the final estimate being rendered January 30, 1912. The contract price, with alterations and authorized increases, was \$1,035,228.05 and the final estimate was \$1,033,864.04.

“ *Contract No. 60.*

“ Contract No. 60 provides for the construction of the canal from the west end of contract No. 6 to about half a mile west of Adams Basin bridge, a distance of 8.53 miles. C. L. Baldwin, Assistant Engineer, is in charge.

“ The contract was let to the Empire Engineering Corporation, of New York city, on September 22, 1908.

“ During the past year most of the work has been the completion of prism excavation and putting finishing touches on the vari-

ous structures. The ladder dredge has worked most of the navigable season west of Spencerport, cleaning up the prism to grade line and disposing of its material generally as embankment on the adjacent tow- or heel-path. Excavation of the wide waters near bridge No. 95 is nearly completed, the material being used in the north approach of bridge No. 95.

"A considerable stretch of the prism bank on the north side of the canal and east of bridge No. 95 showed some seepage on the outside and, to overcome this, the slope and bottom of prism have been covered with a puddle blanket 18 inches thick, showing improvement to the bank. A large proportion of this puddle on the bottom of the prism was placed in the summer of 1912, during the navigable season, the puddle material being loaded on a barge, the barge moored crosswise of the prism and the material then mixed to the proper consistency and cast into a V-shaped, bottomless trough, built along the side of the barge, settling to the bottom and forming an even layer as the barge was moved along. While the resulting puddle may not be as uniformly deposited as when placed in the dry, it is to be incorporated and rolled to satisfaction.

"A small amount of excavation remains to be done, to clean up to grade, as well as some wash wall to be built in scattering places, also clearing up the tow-path and berme bank to the specified grade and width, some paving at culverts and at guard-gate abutments and completing lining and wooden fence on the approaches to bridge No. 95. It is expected that all the work will be completed before the opening of navigation in 1913.

"The following table shows the amounts and percentages of work done during the year and total to end of fiscal year :

ITEMS OF WORK.	Preliminary estimate, as affected by alterations.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Coffer-dams, pumping, etc., miles	8.5	1	8.25	11.8	97.1
Clearing.....lump sum	\$2,600	0	\$2,600	0	100
Grubbing.....cu. yds.	47,644	16	37,178	0.03	78
Excavation.....cu. yds.	1,249,230	79,583	1,136,689	6.4	91
Sheeting and bracing...ft. B. M.	135,000	0	77,774	0	57.6
Channeling.....sq. ft.	26,000	0	15,312	0	58.9
First-class embankment...cu. yds.	749,040	35,752	593,302	4.8	79.2
Second-class embankment, cu. yds.	204,096	17,643	167,294	8.6	82
Lining.....cu. yds.	26,892	3,372	19,332	12.5	71.9

ITEMS OF WORK.	Preliminary estimate, as affected by alterations.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Puddle cu. yds.	63,747	9,865	28,982	15.5	45.5
Sawed lumber, yellow pine or Douglas fir ft. B. M.	41,000	16,221	38,614	39.6	94.2
Foundation piles lin. ft.	19,050	254	5,430	1.3	28.5
Wooden sheet-piling ft. B. M.	42,000	0	9,372	0	22.3
Second-class concrete cu. yds.	13,319	0	13,532	0	101.6
Third-class concrete cu. yds.	3,049	4	2,147	0.1	70.4
Reinforced concrete cu. yds.	1,580	0	1,526	0	96.6
Masonry coping cu. yds.	15	0	12	0	80
Wash wall cu. yds.	66,721	8,293	64,347	12.4	96.4
Second-class stone paving, sq. yds.	6,755	479	3,948	7.1	58.4
Third-class stone paving, sq. yds.	1,860	14	1,801	0.7	96.8
Third-class riprap cu. yds.	559	313	456	56	81.6
Fourth-class riprap cu. yds.	100	44	101	44	101
Cast iron culvert pipe and specials lbs.	676,250	1,600	652,261	2.4	96.5
12-in. vitrified pipe, laid . . . lin. ft.	*760	461	723	60.7	95.1
Trenching and backfilling, 12-in. pipe lin. ft.	20	0	20	0	100
Structural steel lbs.	817,360	1,327	808,393	0.2	98.9
Metal reinforcement lbs.	101,840	0	90,930	0	89.3
Wooden pavement, 3 inches thick sq. yds.	1,330	0	1,304	0	98.1
Wooden pavement, 4 inches thick sq. yds.	650	0	622	0	95.7
Wooden fence lin. ft.	16,902	512	13,759	3	81.4
Wrought iron pipe railing . . . lin. ft.	205	0	138	0	67.3
Lattice railing lin. ft.	410	0	401	0	97.8
Sluice-gate valves, 36 x 40 inches No.	7	0.7	7	10	100
Sluice-gate valves, 33 x 33 inches No.	2	0.2	2	10	100
Repointing old masonry . . . lin. ft.	*6,000	0	1,150	0	19.2
Maintaining navigation, lump sum	\$11,000	\$10,219	\$11,000	7.1	100
Maintaining highway traffic, lump sum	\$3,500	0	\$3,377.50	0	96.5
36-in. vitrified pipe, laid . . . lin. ft.	244	0	239	0	98.4
Additional bailing and draining, lump sum	\$1,500	0	\$1,500	0	100
Gross estimate	*\$1,492,871.91	\$102,923.67	\$1,287,086.80	6.9	86.2
<i>Extra Work Orders.</i>					
Dated Feb. 2, 1909 . . . unit prices	\$5,180.00	.....	\$4,957.87	.....	Finished
Dated April 26, 1909 . . . unit prices	\$1,650.00	.....	\$1,498.00	.....	Finished
Dated Aug. 19, 1909 . . . unit prices	\$4,371.00	.....	\$2,946.47	.....	Finished
Dated Oct. 4, 1909, unit and cost + 15%	\$578.58	.....	\$634.51	.....	Finished
Dated Jan. 3, 1910 . . . cost + 15%	\$1,525.00	.....	\$1,510.76	.....	Finished
Dated Dec. 15, 1910 . . . unit prices	\$11,150.40	.....	\$11,150.40	.....	Finished
Dated March 3, 1911, cost + 15%	\$3,200.00	.....	\$3,113.09	.....	Finished
Dated April 18, 1911, cost + 15%	\$250.00	.....	\$246.79	.....	Finished
Dated Dec. 4, 1911 . . . unit prices	\$788.70	.....	\$782.89	.....	Finished
Dated Sept. 30, 1912 . . . unit prices	\$366.90	0	0	0	0

* Includes authorized increase over 15 per cent.

“ Contract No. 61.

“This contract provides for the improvement of the canal from the west end of contract No. 60 to the west line of Monroe county, a distance of 7.39 miles. A. S. Milinowski and F. C. Ashley,

Assistant Engineers, have been in charge of the work at different times.

“ The contract was let to Cleveland & Sons Company, of Brockport, N. Y., on October 13, 1908.

“ During the year two Lidgerwood excavators have been cleaning up the prism excavation to lines and grades and a large proportion of the prism is now completed.

“ Culverts Nos. 57, 58 and 59 have been rebuilt and also the abutments for bridge No. 110. The superstructures for bridges Nos. 109 and 110 have been completed. The concrete retaining wall for the south approach of bridge No. 109 is practically completed and most of the approach filling is in place. A large amount of wash wall has been built, as well as considerable paving around culverts and bridges. Lining has been placed on the tow-path for a considerable portion of the length of the contract.

“ It is expected that contract No. 61 will be completed before the opening of navigation of 1913.

“ The following table shows the amounts and percentages of work done during the fiscal year and the total done to date:

ITEMS OF WORK.	Preliminary estimate, as affected by alterations.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Coffer-dams, pumping, etc.....miles	7.4	2	6	27	81.1
Clearing.....lump sum	\$2,400	0	\$2,400	0	100
Grubbing.....cu. yds.	48,644	2,087	34,560	4.3	71.1
Excavation.....cu. yds.	969,573	206,707	782,226	21.3	80.7
Sheeting and bracing.....ft. B. M.	*32,000	5,151	30,054	16.1	93.9
First-class embankment.....cu. yds.	566,220	142,060	455,186	25.1	80.4
Second-class embankment.....cu. yds.	95,623	11,632	78,337	12.2	81.9
Lining.....cu. yds.	18,527	5,520	8,397	29.8	45.3
Puddle.....cu. yds.	14,584	332	1,742	2.3	11.9
Sawed lumber, yellow pine or Douglas fir, ft. B. M.	29,000	17,943	24,145	61.9	83.3
Foundation piles.....lin. ft.	3,400	464	2,070	13.6	60.9
Wooden sheet-piling.....ft. B. M.	5,000	0	3,586	0	71.7
Second-class concrete.....cu. yds.	11,746	1,618	10,562	13.8	89.9
Third-class concrete.....cu. yds.	1,495	452	1,270	30.2	85
Reinforced concrete.....cu. yds.	355	65	314	18.3	88.5
Masonry bridge coping.....cu. yds.	8	6.6	6.6	82.5	82.5
Wash wall.....cu. yds.	63,809	31,258	50,875	49	79.7
Second-class stone paving.....sq. yds.	498	269	455	54	91.4
Third-class stone paving.....sq. yds.	1,246	421	535	33.8	42.9
Cobblestone paving.....sq. yds.	204	0	0	0	0
Third-class riprap.....cu. yds.	280	119	119	42.5	42.5
Cast iron pipe and specials.....lbs.	300,100	255,012	297,272	85	99.1
12-in. vitrified pipe, laid.....lin. ft.	418	310	444	74.2	106.2
24-in. vitrified pipe, laid.....lin. ft.	110	0	94	0	85.5
Structural steel.....lbs.	445,015	211,343	425,997	47.5	95.7
Metal reinforcement.....lbs.	45,281	7,589	38,655	16.8	85.4
Wooden pavement, 2½ in. thick.....sq. yds.	820	264	792	32.2	96.6
Wooden pavement, 3½ in. thick.....sq. yds.	220	212	212	96.4	96.4
Wooden fence.....lin. ft.	8,508	3,116	6,249	36.6	73.5

ITEMS OF WORK.	Preliminary estimate, as affected by alterations.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Lattice railing.....lin. ft.	330	310	310	93.9	93.9
Sluice gates and hoists..... No.	3	0	3	0	100
Relaying board walks.....sq. ft.	970	0	0	0	0
Repointing old masonry.....ln. ft.	1,000	0	0	0	0
Drilling bolt holes in masonry.....lin. ft.	1,400	0	544	0	38.9
Maintaining navigation..... lump sum	\$10,000	\$3,000	\$8,500	30	85
Maintaining highway traffic... lump sum	\$2,000	\$900	\$2,000	45	100
Additional bailing and draining.. lump sum	\$4,000	\$3,000	\$3,000	75	75
Portland cement sidewalks.....sq. ft.	2,100	0	0	0	0
Gross estimate.....	*\$1,091,453.35	\$284,629.17	\$861,875	26.1	79
Extra work order, dated Nov. 24, 1909....	\$300	.....	\$101.70	.....	Finished

* Includes authorized increase over 15 per cent.

“ Contract No. 75.

“ This contract provides for the construction of three guard-gate superstructures at the following locations: About 1.3 miles east of Spencerport; near the west line of Brockport and 1.5 miles east of Middleport. The first two structures are within the limits of Residency No. 9; the other gate is in Residency No. 10-A.

“ The contract work is being performed by the United Construction Company, of Albany, N. Y., and was let March 1, 1910.

“ The guard-gate superstructures near Spencerport and Brockport were practically completed on May 15, 1912, but an ‘extra or unspecified work order,’ requiring several minor additions and changes, the work of which has not been entirely completed, prevents the rendering of the final estimate.

“ The following table shows the amounts and percentages of work done on the whole contract during the fiscal year and the total done to date:

ITEMS OF WORK.	Preliminary estimate.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Metal in guard-gate.....lbs.	700,000	669,563	669,563	95.6	95.6
Second-class concrete.....cu. yds.	97	85	85	87.6	87.6
Sawed lumber.....ft. B. M.	*1,550	1,534	1,534	99	99
Gross estimate.....	*\$42,950.00	\$40,999.94	\$40,999.94	95.5	95.5
Extra work order, dated Aug. 22, 1912, cost + 15% .....	.....	.....	.....	.....	.....

* Includes authorized increase over 15 per cent.
Portion of contract within Residency No. 9, 67 per cent; work completed, 96 per cent.
Portion of contract within Residency No. 10-A, 33 per cent; work completed, 95.2 per cent.

"Contract No. 105.

"This contract provides for the construction of five lift bridges over the Erie canal and all appertaining construction, at the following locations: Union street, Spencerport; Washington street, Adams Basin; Park avenue, Brockport; Hulburton, Sta. 4091 + 89.67, and Gasport, Sta. 5530 + 33. The first three structures are within the limits of Residency No. 9, the fourth structure is in Residency No. 10-A and the last structure is in Residency No. 10-B.

"The contract was let, April 19, 1912, to Skene and Richmond, of Louisa, Ky.

"At the Spencerport bridge no work has been done. At Adams Basin bridge the counterweight and machinery pits have been completed, except the concrete cover plates. The steel superstructure has been assembled on false work and practically all riveted.

"At the Brockport bridge the north pit is completed and some excavation has been done for the south pit. At both the above bridges it has been necessary to use considerable coffer-dam work on account of the treacherous material encountered. This is especially true at Brockport, where a seam of sand 'blew out' during excavation and caused a small break in the canal bank, which, however, did little damage, on account of the high ground adjacent to the break. The trouble was soon remedied by driving steel sheet-piling, backed with earth embankment.

"The following table shows the amounts and percentages of work done on the whole contract during the year and total done to end of fiscal year:

ITEMS OF WORK.	Preliminary estimate.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Coffer-dams, pumping, etc.....hump sum	\$3,000	\$1,674	\$1,674	55.8	55.8
Excavation.....cu. yds.	44,000	5,395	5,395	12.2	12.2
Sheeting and bracing.....ft. B. M.	*115,000	59,855	59,855	52	52
Forming embankment.....cu. yds.	4,000	470	470	11.8	11.8
Lining.....cu. yds.	1,300	7	7	0.5	0.5
Sawed lumber, yellow pine.....ft. B. M.	96,000	0	0	0	0
Second-class concrete.....cu. yds.	3,200	398	398	12.4	12.4
Reinforced concrete.....cu. yds.	4,400	1,154	1,154	26.2	26.2
W a h wall.....cu. yds.	500	0	0	0	0
Cobt estone paving.....sq. yds.	560	0	0	0	0
Cast iron pipe and specials.....lbs.	20,000	258	258	12.9	12.9
Structural steel.....lbs.	1,470,000	1,817	1,817	0.1	0.1

ITEMS OF WORK.	Preliminary estimate.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Machinery..... lbs.	200,000	0	0	0	0
Metal reinforcement..... lbs.	282,000	85,018	85,018	30.1	30.1
Portland cement sidewalk..... sq. ft.	1,680	0	0	0	0
Brick pavement..... sq. yds.	230	0	0	0	0
Wooden fence..... lin. ft.	600	0	0	0	0
Lattice railing..... lin. ft.	2,100	0	0	0	0
Drilling holes in rock..... lin. ft.	500	7	7	1.4	1.4
Electrical equipment..... No.	5	0	0	0	0
Electric pumps..... No.	5	0	0	0	0
Operator's cabin..... No.	5	0	0	0	0
Maintaining navigation..... lump sum	\$2,500	\$761.25	\$761.25	30.5	30.5
Maintaining highway traffic..... lump sum	\$3,000	\$362.50	\$362.50	12.1	12.1
Gross estimate.....	*\$263,810	\$30,643.66	\$30,643.66	11.6	11.6

* Includes authorized increase over 15 per cent.
Portion of contract within Residency No. 9, 66 per cent; completed, 16.7 per cent.
Portion of contract within Residency No. 10-A, 17 per cent; completed, 2.8 per cent.
Portion of contract within Residency No. 10-B, 17 per cent; completed, 2 per cent.

ERIE CANAL, RESIDENCY No. 10-A.

Resident Engineer J. V. Hogan reports:

“ Residency No. 10-A extends from the easterly line of Orleans county to 100 feet east of Main street bridge in Gasport, a distance of about 32 miles, which includes contracts Nos. 62, 9, 64 and 65 and portions of contracts Nos. 75, 105 and 106.

“ During the latter part of the year a Calyx drill outfit has been at work procuring cores from various appropriated lands, in connection with requests from the Board of Claims, to determine the feasibility of using land for quarry purposes.

“ Contract No. 62.

“ This contract provides for the improvement of the Erie canal from the easterly line of Orleans county to 0.16 of a mile east of Eagle Harbor bridge, a distance of 14.15 miles.

“ The contract was let to I. M. Ludington's Sons, Inc., of Rochester, N. Y., August 11, 1910. J. S. Summers, Assistant Engineer, has been in charge of the Holley section, extending to Brockville, and George D. Kellogg and A. S. Milinowski, Assistant Engineers, have been in charge at different times of the Albion section.

“ The length of the contract, together with the diversity of material encountered in excavation, caused the contractors to rely on

BARGE CANAL, CONTRACT NO. 62.

Rubble walls, laid in mortar, near Hullerton: used where adjacent quarry excavations have gone below canal bottom and where quarry spalls underlie ground surface.

several small excavating units rather than to install complicated machinery of special type.

“The necessity of maintaining navigation during the summer months has made necessary the accomplishment of the greater part of the contract work during the closed season of navigation. During the preceding winter there were simultaneously excavating on this contract four Bucyrus and three Marion shovels of 65 to 75 tons, one Bucyrus, three McMyler and one Lidgerwood drag-line excavators, together with eight movable derricks with either clam-shell or orange-peel buckets. During the navigable season the Lidgerwood and Bucyrus excavators worked from the berme bank and several team-and-scraper outfits trimmed slopes and cut wash wall notch.

“During the past year culverts Nos. 63, 70, 71, 73, 75, 78, 82 and 83 have been completed. County Line, Brockville, Transit, Jaquith's, Bidwell's, Bailey's, Hall's and Gaines bridges have been erected and the new waste-weirs at Holley, Brockville and Eagle Harbor have been finished. There has also been placed about 4,100 cubic yards of concrete in the Holley trough, 9,800 yards in the Albion vertical walls and 3,000 yards in the Eagle Harbor trough, together with practically 8,000 cubic yards of rubble masonry placed in the Hulburton walls. In round numbers, 43,000 cubic yards of stone have been placed in wash wall and considerable paving and riprap have been laid at various points on the contract.

“The attached table shows the percentage of work done during the year and to date:

ITEMS OF WORK.	Preliminary estimate, as affected by alterations.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Coffer-dams, pumping, bailing and draining miles	14.15	7.38	11	52.2	77.9
Clearing.....lump sum	\$7,200	\$2,786	\$7,200	38.7	100
Excavation.....cu. yds.	1,659,860	740,531	1,314,879	44.6	79.3
Sheeting and bracing.....ft. B. M.	160,000	35,520	66,890	22.2	41.8
Round timber bracing.....lin. ft.	2,000	28	466	1.4	23.3
Channeling.....sq. ft.	11,960	2,011	2,600	16.9	21.7
Forming embankment.....cu. yds.	711,358	253,530	469,558	35.6	66
Lining.....cu. yds.	37,795	773	773	2	2
Puddle.....cu. yds.	30,000	501	623	1.7	2.1
Sawed lumber, yellow pine or Douglas fir ft. B. M.	64,000	22,040	24,350	34.5	38
Foundation piles.....lin. ft.	8,000	480	1,100	6	13.7

ITEMS OF WORK.	Preliminary estimate, as affected by alterations.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Second-class concrete.....cu. yds.	60,480	27,966	37,003	46.3	61.4
Third-class concrete.....cu. yds.	4,429	1,702	3,459	38.5	78.3
Reinforced concrete.....cu. yds.	4,160	1,811	2,846	43.6	68.5
First-class masonry coping.....cu. yds.	29	16	18	55.3	62.1
Rubble masonry.....cu. yds.	9,034	7,921	8,705	87.8	96.5
Wash wall.....cu. yds.	98,813	43,246	47,840	43.8	48.4
Second-class stone paving.....sq. yds.	8,280	979	979	11.8	11.8
Third-class stone paving.....sq. yds.	14,300	1,172	1,172	8.2	8.2
Cast iron culvert pipe and specials.....lbs.	1,704,000	587,531	1,318,539	34.5	77.4
Trenching and backfilling 8-in. vitrified pipe lin. ft.	450	0	200	0	44.5
Structural steel.....lbs.	2,402,620	1,303,317	1,576,892	54.4	65.5
Metal reinforcement.....lbs.	575,070	245,518	334,363	42.7	58.1
Iron castings, plain.....lbs.	19,100	735	735	3.8	3.8
Expanded metal.....lbs.	570	330	570	58	100
Wooden pavement, 2½ in. thick.....sq. yds.	3,224	2,790	3,116	86.6	96.6
Wooden pavement, 3½ in. thick.....sq. yds.	1,302	254	254	19.5	19.5
Wooden fence.....lin. ft.	13,005	2,990	2,990	23	23
Wrought iron pipe railings.....lin. ft.	85	82	82	96.5	96.5
Drilling bolt holes in old masonry.....lin. ft.	840	333	333	39.7	39.7
Waste-gates, 24 x 24 inches.....No.	7	4	4	57.2	57.2
Waste-gates, 36 x 36 inches.....No.	7	6	6	85.8	85.8
Metal in guard-gates.....lbs.	465,000	75,522	206,522	16.2	44.3
1 ft-bridge machinery.....lbs.	100,000	5,600	5,600	5.6	5.6
Tar felt waterproofing.....sq. ft.	264,800	37,265	37,265	14.1	14.1
Removing old bridge superstructures lump sum	\$000	\$150	\$150	25	25
Maintaining navigation.....lump sum	\$16,800	\$7,140	\$13,440	42.5	80
Maintaining highway traffic.....lump sum	\$5,400	\$5,160	\$7,140	61.5	85
Buildings to be removed.....No.	68	14	40	20.6	58.9
Deduct for bridge superstructures.....lump sum	\$600	\$320	\$420	53.4	70
Sand filling.....cu. yds.	4,900	566	566	11.6	11.6
Gross estimate.....	\$2,515,040	\$1,042,310	\$1,629,640	41.5	64.8

“ Contract No. 9.

“ This contract extends from 0.16 mile east of Eagle Harbor bridge to 0.09 mile west of Beal’s bridge, a distance of 5.68 miles.

“ The contract was let to the Thomas Crimmins Contracting Company, on March 18, 1908, and was completed and accepted during 1911.

“ The contractors have filed a claim against the State with the Board of Claims, and this Department has collected data and made investigations in connection with preparing defense for this claim, which will be brought to trial in the near future.

“ Contract No. 65.

“ This contract extends from a point 475 feet west of Beal’s bridge to a point 600 feet west of Prospect street bridge, Medina. A. S. Whitbeck, Assistant Engineer, has been in charge of the preliminary work.

" It was the original intention to diverge from the route of the present Erie canal in the stretch covered by this contract and to construct a cut-off across Oak Orchard gorge, consisting principally of a concrete aqueduct, the span of which was planned to be about 285 feet. Early in the present year it was decided to abandon this scheme and to construct the new canal along the route of the present canal through the village of Medina. In accordance with the change, a preliminary survey was made and cross-sections taken over the new route.

" In accordance with a request of the designing department, investigations were made in connection with the location of new structures and bar soundings were taken throughout the entire length of the contract. Plans are reported as being 98 per cent completed and the contract will undoubtedly soon be advertised for letting.

" Contract No. 64.

" This contract provides for the improvement of the Erie canal from a point 600 feet west of Prospect street bridge, Medina, to a point 100 feet east of Gasport bridge, a distance of 9.91 miles. R. H. Merrill, Assistant Engineer, is in charge of work.

" This contract was let to the Empire Engineering Corporation on August 6, 1908.

" Very little construction work was done on this contract during the winter months. A hand gang, with teams, placed puddle, shaped up banks and did some excavating.

" The section in the vicinity of Watson's, where rock occurs above grade, was drilled and blasted, in order that it might be moved later by dipper-dredge.

" Concrete was placed at the Middleport waste-weir and at Gasport guard-gate.

" The contractors installed a machine shop at Middleport and during the winter months constructed the dipper-dredge *Empire* and overhauled and put in working order the dipper-dredge *Peconic*. These dredges were in commission during the season of navigation and did satisfactory work. Two derrick boats are also

used, together with a fleet of tugs and scows, by which means lining and wash wall have been distributed and placed.

“ Work during the past year has been confined between Middleport and Gasport, and with the exception of a small amount of slope trimming to be done after water is drawn from the canal, the section between Middleport and Gasport will be completed by the close of navigation.

“All the structures are completed on this contract and the final estimates computed as far as conditions in the field would warrant.

“ The attached table shows the percentage of work done during the year and to date :

ITEMS OF WORK.	Preliminary estimate, as affected by alterations Nos. 2 to 10, inclusive.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Coffer-dams, pumping, bailing and draining miles	10	0	6	0	60
Clearing..... lump sum	\$2,600	0	\$2,210	0	85
Grubbing..... cu. yds.	54,982	6,789	35,563	12.3	64.7
Excavation..... cu. yds.	1,138,281	120,168	616,789	10.6	54.2
Forming embankment, first-class..... cu. yds.	413,731	29,659	248,293	7.2	60.1
Forming embankment, second-class..... cu. yds.	121,060	8,600	105,159	7.1	86.9
Lining..... cu. yds.	26,034	2,472	4,243	9.5	16.3
Puddle..... cu. yds.	4,517	809	1,555	17.9	34.4
Sawed lumber, yellow pine or Douglas fir ft. B. M.	60,500	0	22,808	0	37.7
Foundation piles..... lin. ft.	3,500	0	2,300	0	65.7
Wooden sheet-piling..... ft. B. M.	134,000	0	36,456	0	27.2
Second-class concrete..... cu. yds.	17,231	1,149	15,754	6.7	91.4
Third-class concrete..... cu. yds.	3,201	0	2,702	0	84.4
Reinforced concrete..... cu. yds.	728	0	659	0	90.6
First-class masonry..... cu. yds.	64	0	48	0	75
First-class masonry backing..... cu. yds.	0	0	0	0	0
First-class masonry bridge coping..... cu. yds.	50	0	9	0	18
Wash wall..... cu. yds.	69,702	14,187	33,251	20.4	47.8
Second-class stone paving..... sq. yds.	2,160	147	317	6.8	14.7
Third-class stone paving..... sq. yds.	2,800	790	1,285	28.2	45.8
Third-class riprap..... cu. yds.	420	190	202	45.2	48.1
Cast iron pipe and specials..... lbs.	1,109,805	8,800	1,121,631	0.8	100
Structural steel..... lbs.	957,360	789	943,947	0.1	98.6
Metal reinforcement..... lbs.	67,000	1,238	61,647	1.8	92.1
Wood pavement..... sq. yds.	2,600	0	2,311	0	88.9
Wooden fence..... lin. ft.	12,348	4,921	7,004	37.1	52.8
Sluice-gate valves..... No.	7	0	7	0	100
Relaying old masonry..... cu. yds.	180	0	17	0	9.4
Repointing..... lin. ft.	1,500	0	0	0	0
Maintaining navigation..... lump sum	\$13,000	0	\$11,050	0	84.7
Maintaining highway traffic..... lump sum	\$4,500	0	\$3,375	0	75
Deduct for buildings and bridge superstructures lump sum	\$4,400	0	0	0	0
Additional bailing and draining..... lump sum	\$500	\$200	\$500	40	100
6-inch vitrified pipe, laid..... lin. ft.	270	0	260	0	96.3
Additional bailing and draining, alteration No. 8..... lump sum	140	0	140	0	100

Percentage of work completed during year = 9.9.
Percentage of work completed to date = 62.0.

11 12 13 14 15

Section of completed prism near Gasport.

Section of completed prism near Gasport.

“ Contract No. 75.

“ This contract provides for the erection of three guard-gate superstructures, one of which is located on this residency, 1½ miles east of Middleport. R. H. Merrill, Assistant Engineer, in charge.

“ Contract No. 75 is being performed by the United Construction Company and was let on March 1, 1910.

“ The guard-gate superstructure has been erected and is complete with the exception of track in the north abutment, which is yet to be lined up. The concrete sill under the north span is also unfinished. This work will be done as soon as water is drawn from the canal at the end of the present season of navigation. There is also some work to be done in connection with an ‘ Extra or unspecified work order,’ providing for several minor changes in the operating equipment.

“ The table giving percentage of work done during the year will be found attached to the report of Residency No. 9.

“ Contract No. 105.

“ This contract provides for the construction of five lift-bridges, one of which is at Hulburton on this residency. J. S. Summers, Assistant Engineer, is in charge.

“ The contract was let to Skene and Richmond, of Louisa, Ky., April 19, 1912.

“ The contractors have very recently started work on the south abutment pit of the Hulburton bridge. About 700 cubic yards of excavation have been removed.

“ The table giving the amount done on the whole contract is included in the report of Residency No. 9.

“ Contract No. 106.

“ This contract provides for the construction of four lift-bridges, two of which are located on Residency No. 10-A; one at Prospect street, Medina, and one at Main street, Middleport.

"The contract has not yet been awarded, but plans are about 95 per cent completed. Location surveys were made and cross-sections taken at the site of each of these bridges.

"Repairs to Oak Orchard Feeder."

"Under chapter 547 of the laws of 1912 an appropriation was made to repair the so-called Oak Orchard feeder, situated 9½ miles south of Medina. Cross-sections have been taken and plans prepared covering proposed repairs."

ERIE CANAL, RESIDENCY No. 10-B.

Resident Engineer George C. Andrews reports:

"This residency extends from a point about 100 feet east of Gasport bridge westward to the Sulphur Springs guard-lock, a distance of 11.7 miles.

"Construction work is divided into four contracts — Nos. 66, 67, 40 and 105. With the exception of two lift-bridges at Lockport, all the work on the residency is under contract.

"Contract No. 66."

"This is the most westerly contract on the 'Sixty-mile level' and extends from a point 100 feet east of Gasport bridge to a point about 600 feet east of the Lockport locks, a distance of 6.35 miles. R. C. Georger, Assistant Engineer, is in charge.

"The contract was awarded on September 22, 1908, to the Empire Engineering Corporation of New York city, and has been affected by six alterations, which increased the amount of the contract by approximately \$79,000.

"During the past year a 300-foot concrete facing wall was built at Gasport and the concrete wall at Lockport completed. The Lake avenue bridge approach was also finished, completing the structures on the contract.

"Steel sheet-piles to the number of 2,049 were placed in the tow-path at Lockport and several thousand yards of puddle placed at various points along the prism.

BARGE CANAL, CONTRACT No. 08.
South approach to Lake avenue bridge, Lockport.

" Practically all the work on this contract has been completed, excepting a small amount of excavation.

" Excavation during the year was made by a ladder-dredge, floating cranes, steam-shovels and hand labor.

" In view of the alterations, the contract time has been extended to December 1, 1912.

" The following table shows work accomplished during the year and to date:

ITEMS OF WORK.	Preliminary estimate, as affected by alterations.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Coffer-dams, pumping, bailing and draining miles	6.35	1.132	5.912	17.3	93.1
Clearing.....hump sum	\$1,900	\$95	\$1,900	5	100
Grubbing.....cu. yds.	30,925	0	20,999	0	67.9
Excavation.....cu. yds.	665,492	114,813	613,706	17.3	92.1
Sheeting and bracing.....ft. B. M.	148,000	0	59,501	0	40.2
Forming first-class embankment.....cu. yds.	287,472	18,897	185,318	6.6	64.5
Forming second-class embankment.....cu. yds.	63,200	5,444	63,559	8.6	101.5
Lining.....cu. yds.	17,184	6,317	14,826	36.8	86.2
Puddle.....cu. yds.	8,374	5,919	11,884	70.8	141.9
Sawed lumber, yellow pine.....ft. B. M.	18,000	0	17,850	0	99.2
Foundation piles.....lin. ft.	3,830	0	3,522	0	92
Second-class concrete.....cu. yds.	14,943	1,738	14,631	11.6	98
Third-class concrete.....cu. yds.	2,058	0	1,814	0	88.3
Reinforced concrete.....cu. yds.	561	9	524	1.6	93.5
First-class masonry bridge coping.....cu. yds.	10	0	8.67	0	86.7
Wash wall.....cu. yds.	52,656	5,416	37,899	10.3	71.9
Second-class stone paving.....sq. yds.	685	116	694	16.9	101.3
Third-class stone paving.....sq. yds.	1,432	427	1,533	29.8	106.9
Third-class riprap.....cu. yds.	500	257	331	51.4	66.2
Cast iron culvert pipe and specials.....lbs.	452,360	3,277	414,154	0.7	91.5
Structural steel.....lbs.	683,600	4,402	664,250	0.6	97.2
Metal reinforcement.....lbs.	55,900	0	46,676	0	83.5
Wood pavement, 4 in. thick.....sq. yds.	340	0	333	0	98
Wood pavement, 3 in. thick.....sq. yds.	1,200	0	1,155	0	96.2
Wood fence.....lin. ft.	8,640	968	7,177	11.2	83.1
Wrought iron pipe railing.....lin. ft.	30	0	26	0	86.7
Lattice railing.....lin. ft.	640	0	632	0	98.8
Sluice-gate valves.....No.	3	0	3	0	100
Drilling bolt holes in masonry.....lin. ft.	650	391	746	60.2	114.8
Maintaining navigation.....hump sum	\$8,250	\$1,468.50	\$7,680.75	17.8	93
Maintaining highway traffic.....hump sum	\$3,000	\$534	\$2,793	17.8	93
Additional pumping, bailing and draining hump sum	\$750	\$75	\$750	10	100
Steel sheet-piling, 16-ft. long.....per pile	1,800	1,145	2,049	113.8	113.8
Deduct for sheeting and bracing used second time.....ft. B. M.	.....	0	3,194	0	.....
Gross estimate.....	\$854,394	\$145,370	\$764,240	17	89.4

" Contract No. 67.

" This contract provides for the construction of the canal prism, with two locks and other structures at Lockport, extending from the west end of contract No. 66 to the east end of contract No. 40,

a distance of 0.57 mile. Edward Anderberg, Assistant Engineer, is in charge.

" The contract was awarded to Larkin and Sangster on September 3, 1910, at the contract price of \$1,149,401.25. Work was begun October 3, 1910. Alteration No. 1, providing for an extension of the Main street bridge, increased the contract by about \$59,000.

" The previous year's work had left this contract in good shape for rapid work and the contractors took advantage of it. During the past year the excavation for locks Nos. 34 and 35 was completed. Lock No. 35 was practically completed and 80 per cent of the concrete placed in Lock No. 34. The upper gates and valves of lock No. 35 were placed. Transit street bridge was erected and 50 per cent of the steel work in the Main street bridge placed and riveted. Besides this, some prism excavation was made above and below the locks.

" The principal plant on the work is an air-compressor station, one 70-ton Bucyrus shovel, one Thew shovel, three dinkey train outfits, two concrete mixers, channelers, drills, derricks, etc.

" The following table shows the amount of work done during the year and to date:

ITEMS OF WORK.	Preliminary estimate, as affected by alterations.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Excavation.....cu. yds.	261,000	89,404	199,676	34.3	76.5
Tunnel excavation.....cu. yds.	6,700	0	6,028	0	90
Sheeting and bracing.....ft. B. M.	48,000	3,331	12,578	6.9	26.2
Channeling.....sq. ft.	160,000	13,170	42,110	8.2	26.3
Forming embankment.....cu. yds.	1,200	0	19	0	1.6
Sawed lumber.....ft. B. M.	9,500	5,750	8,297	60.5	87.2
White oak lumber in lock-gates.....ft. B. M.	18,000	4,000	4,000	22.2	22.2
Cresoted lumber.....ft. B. M.	285,000	77,785	77,785	27.4	27.4
Round timber bracing.....lin. ft.	3,000	174	303	5.8	10.1
Second-class concrete.....cu. yds.	61,300	29,220	39,547	47.7	64.5
Tunnel lining.....cu. yds.	2,900	0	21	0	0.7
Reinforced concrete.....cu. yds.	427	50	364	11.7	85.4
First-class masonry coping.....cu. yds.	65	11	11	16.9	16.9
Grouted riprap.....cu. yds.	800	0	25	0	3.1
Fourth-class riprap.....cu. yds.	700	0	30	0	4.3
6-inch vitrified pipe, laid.....lin. ft.	410	65	65	15.8	15.8
12-inch vitrified pipe, laid.....lin. ft.	900	471	626	52.3	69.6
15-inch vitrified pipe, laid.....lin. ft.	900	808	832	89.8	92.4
Metal reinforcement.....lbs.	192,500	38,786	131,785	20.3	68.5
Structural steel.....lbs.	4,381,000	2,100,119	2,202,187	48	50.3
Iron castings, plain.....lbs.	193,800	122,211	164,951	62.9	85
Iron castings, machined.....lbs.	38,200	18,330	32,165	47.9	84.2
Metal in lock-gates.....lbs.	620,000	182,539	182,760	29.4	29.5
Metal in lock-valves.....lbs.	88,500	26,030	26,030	27.4	27.4
Metal in buffer-beams.....lbs.	103,000	37,772	37,772	36.7	36.7

View from Pine street bridge, Lackport, looking down on east end of lock No. 34 and showing also the lower locks of the north tier of old locks.

ITEMS OF WORK.	Preliminary estimate, as affected by alterations.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Wood block pavement.....sq. yds.	6,500	1,594	1,594	24.5	24.5
Drilling bolt holes in rock.....lin. ft.	7,200	1,582	2,813	21.9	37
Wrought iron pipe railing.....lin. ft.	1,200	468	468	3.9	3.9
Lattice railing.....lin. ft.	535	447	447	83.5	83.5
Fiber ducts.....lin. ft.	4,000	1,288	1,559	32.2	39
Gate hoists.....No.	6	0	4	0	66.7
48-inch valves.....No.	3	0	3	0	100
Maintaining highway traffic.....lump sum	\$2,750	\$1,072.50	\$1,760	39	64
Maintaining electric railway traffic.....lump sum	\$600	\$234	\$384	39	64
Maintaining navigation.....lump sum	\$4,000	\$1,560	\$2,560	39	64
Removing buildings.....No.	20	3	18	15	90
Replacing brick pavement.....sq. yds.	1,760	53.5	53.5	3.2	3.2
Coffer-dams, pumping, bailing and draining lump sum	\$16,500	\$6,435	\$10,560	39	64
Gross estimate.....	\$1,208,110	\$450,400	\$739,440	37.4	61.2

“ Contract No. 40.

“ This contract extends from the west end of contract No. 67, in the city of Lockport, to Sulphur Springs guard-lock at Pendleton, where it adjoins contract No. 19. Length of contract, 4.84 miles. Assistant Engineer Huber is in charge.

“ The contract has been under construction by the United Engineering and Contracting Company, of New York city, since March, 1909. The contract price was \$2,168,298, but this has been increased by three alterations to \$2,252,144.

“ The work of this contract consists mainly of earth and rock excavation, following the line of the old Erie canal. Both the nature of the work and the plant which the contractors have placed on the job make it necessary that the work be done in the ‘dry,’ rendering it impossible to do more than minor work during the period of navigation.

“ During the past year approximately 450,000 cu. yds. of earth and rock were excavated, of which 448,000 cu. yds. were taken out up to May 15, 1912.

“ The principal plant on the work was as follows: Steam-shovel and trains near Prospect street, which removed 29,000 cu. yds. of rock; cableway and steam-shovel plant, which removed 64,000 cu. yds. of earth and rock; cantilever excavator and conveyor, which removed 111,000 cu. yds. of earth; double-boom

crane and shovel, which excavated 124,000 cu. yds. of rock; a Browning crane excavator, with derrick bucket and tipple conveyor, which handled 54,000 cu. yds. of earth.

“ Riley’s and Summit street bridges were completed and the concrete substructures for Prospect street bridge, Hawley’s bridge and the north abutment of the guard-lock bridge were built. Practically all the steel for the new guard-gate was assembled and riveted.

“ The following table shows the work done during the year and to date:

ITEMS OF WORK.	Preliminary estimate, as affected by alterations.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Coffer-dams, pumping, bailing and draining. lump sum	\$10,000	\$3,820	\$8,820	38.2	88.2
Clearing..... lump sum	\$2,000	0	\$2,000	0	100
Excavation..... cu. yds.	2,372,905	449,498	1,924,580	18.9	81.1
Sheeting and bracing..... ft. B. M.	20,000	9,027	27,392	45.1	136.9
Channeling..... sq. ft.	191,760	27,403	191,679	14.3	100
Forming embankment..... cu. yds.	32,000	3,268	8,176	10.2	25.6
Lining..... cu. yds.	6,975	487	487	7	7
Sawed lumber, yellow pine or Douglas fir, ft. B. M.	12,000	3,636	3,636	30.3	30.3
Foundation piles..... lin. ft.	770	0	378	0	49.1
Second-class concrete..... cu. yds.	7,459	2,180	5,243	29.2	70.3
Third-class concrete..... cu. yds.	519	30	392	5.7	75.5
Reinforced concrete..... cu. yds.	554	260	392	46.9	70.8
Wash wall..... cu. yds.	43,508	5,787	19,059	13.3	43.8
Second-class riprap..... cu. yds.	150	43	43	28.7	28.7
Third-class riprap..... cu. yds.	334	19	25	5.7	7.5
Fourth-class riprap..... cu. yds.	36,100	16,804	16,804	46.5	46.5
Structural steel..... lbs.	627,140	277,300	278,509	44.2	44.4
Metal reinforcement..... lbs.	70,840	27,236	49,002	38.4	69.2
Metal in guard-gate..... lbs.	525,000	469,887	469,887	89.5	89.5
Wooden pavement, 2½ in. thick..... sq. yds.	830	263	263	31.7	31.7
Wooden pavement, 3½ in. thick..... sq. yds.	550	258	258	46.9	46.9
Wooden fence..... lin. ft.	904	551	551	60.9	60.9
Lattice railing..... lin. ft.	700	397	397	56.9	56.9
Drilling bolt holes in rock..... lin. ft.	550	16	416	2.9	75.6
Trenching and backfilling, 18-in. pipe..... lin. ft.	66	0	48	0	72.7
Relaying 48-in. cast iron pipe..... lin. ft.	66	0	48	0	72.7
Maintaining navigation..... lump sum	\$5,000	\$1,750	\$4,250	35	85
Maintaining highway traffic..... lump sum	\$500	\$50	\$300	10	60
Ditch excavation..... cu. yds.	38,250	0	24,093	0	62.6
Deduct sheeting and bracing (used second time) ft. B. M.	.....	2,566	2,566	.....	.....
Gross estimate.....	\$2,252,144	\$445,410	\$1,738,530	21.1	77.2

“ Contract No. 105.

“ This contract calls for the construction of five lift-bridges over the Erie canal, one of which is on this residency, at Gasport. R. C. Georger, Assistant Engineer, is in charge.

BARGE CANAL, CONTRACT No. 67.
View looking up through chamber of locks Nos. 34 and 35.

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"The contract was let April 19, 1912, to Messrs. Skene and Richmond, of Louisa, Kentucky.

"Work was started at the Gasport lift-bridge on September 12, 1912. The total contract is for \$258,710, of which it is estimated the Gasport bridge will cost \$44,050.50.

"To date the contractor has installed his plant for excavating and concreting and has started the excavation for the south abutment.

"The table giving the amount done on the whole contract is included in the report of Residency No. 9. The following table shows the work done on this residency to date:

ITEMS OF WORK.	Preliminary estimate.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Excavation.....cu. yds.	6,957	725	725	10.4	10.4
Maintaining navigation.....lump sum	\$425	\$106.25	\$106.25	25	25
Maintaining highway traffic.....lump sum	\$900	\$112.50	\$112.50	12.5	12.5
Gross estimate (for Gasport bridge only).....	\$44,050	\$880	\$880	2	2

ERIE CANAL, RESIDENCY NO. 11.

Resident Engineer George C. Andrews reports:

"This residency extends from the Sulphur Springs guard-lock at Pendleton to and through the city of Buffalo. Two Barge canal contracts are embraced in this residency, contract No. 19 and one not yet advertised, which extends from the Delaware avenue bridge, Tonawanda, to the Niagara river, a distance of about 2,500 feet.

"Contract No. 19.

"This contract extends from the Pendleton guard-lock to Delaware avenue bridge, Tonawanda, a distance of 12.46 miles. O. L. Burdett, Assistant Engineer, is in charge.

"The contract was let to the Great Lakes Construction Company, of Buffalo, N. Y., on November 26, 1906. Work was begun on May 25, 1907.

"The original contract price was \$1,002,171, but it has been affected by three alterations, which reduced the amount of the contract by about \$109,000.

"The contract is essentially a dredging proposition, extending about 11½ miles along Tonawanda creek and about one mile along typical artificial canal. During the year 226,000 cubic yards were excavated, of which the hydraulic dredge *Niagara* removed 215,000 cubic yards in eight working months, having been laid up from November 30 until April 1 on account of the severe winter. The dipper dredge *Buffalo* was operated eight months in excavating and casting over material, which was later handled by the hydraulic dredge. The excavator *Lehigh*, equipped with Page bucket, was employed eight months, building dikes for hydraulic spoil banks.

"After the close of navigation, the coffer-dam across the canal at McDonald's culvert was rebuilt and a Marion steam-shovel and train outfit installed between McDonald's culvert and the guard-lock. This shovel removed 10,500 cu. yds. of rock, which completed the rock excavation on the contract.

"During the year two slides occurred. One removed 150 feet of the tow-path and the other destroyed the timber dock at Martinsville. This latter structure was rebuilt with a heavier construction.

"During the year 34,800 ft. B. M. of triple lap sheet-piling were placed in the stream entrances.

"The following table shows the work done during the year and to date:

ITEMS OF WORK.	Preliminary estimate, as affected by alterations.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Excavation, guard-lock to Sta. 6180... cu. yds.	240,000	11,325	223,960	4.7	93.3
Excavation, Sta. 6180 to Tonawanda... cu. yds.	3,217,000	215,204	2,696,190	6.7	83.8
Sheeting and bracing... ft. B. M.	974,000	0	1,038,241	0	106.6
Forming embankment... cu. yds.	36,000	231	26,732	0.6	74.3
Lining... cu. yds.	2,200	25	905	1.1	41.1
Sawed lumber, yellow pine... ft. B. M.	24,000	0	21,475	0	89.5
Sawed lumber, hemlock... ft. B. M.	40,000	0	27,636	0	69.1
Round timber in cribs... lin. ft.	16,000	2,571	20,285	16.1	126.8
Stone filling in cribs... cu. yds.	850	182	552	21.4	64.9
Foundation piles, 20 ft. long... No.	340	0	85	0	25
Fender piles, 30 ft. long... No.	40	0	9	0	22.5
Sheet-piling... ft. B. M.	44,000	36,197	44,567	82.3	101.3

BARGE CANAL, CONTRACT NO. 67.

North abutment, Main street bridge, Lockport. Local conditions, which make of this bridge a public square in the center of the city, demand a peculiar structure. It is a three-hinged, deck, plate-girder, arch bridge, with a span of 116 ft. 10 in. between end pins and a rise of 12 ft. between center and end pins. Its width, 475 ft., takes in two streets and the block between. To secure proper clearance above water surface and not elevate the street grade, a unique form of girder was designed, as shown in the view. Instead of being uniformly arched, it has an angular shape at the outer end.

ITEMS OF WORK.	Preliminary estimate, as affected by alterations.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Second-class concrete.....cu. yds.	15,900	0	12,987	0	81
Reinforced concrete.....cu. yds.	400	0	365	0	91.3
Metal reinforcement.....lbs.	45,770	0	42,737	0	93.4
First-class masonry coping.....cu. yds.	6	0	3.9	0	65
Third-class riprap.....cu. yds.	360	56	56	15.6	15.6
Cobblestone paving.....sq. yds.	95	0	62	0	65.1
Wooden fencing.....lin. ft.	1,500	402	1,560	26.8	104
Structural steel.....lbs.	257,640	0	243,900	0	94.7
Removing bridge superstructures.....hump sum	\$359	0	\$359	0	100
Raising bridge superstructures.....hump sum	\$3,599	0	\$2,598.48	0	72.2
Maintaining traffic.....hump sum	\$599	\$28.75	\$497.17	4.8	83
Gross estimate.....	\$891,401	\$46,560	\$749,690	5.2	84.1

CONCLUSION.

A statement of the engineering expenses of the Division and tables of contracts pending as well as those completed during the fiscal year follow.

I desire to express to you and to your deputies my gratitude for the valuable assistance and consideration that you have given me in the performance of my duties. I also desire to thank all the employees of the Division for the faithful and efficient services they have rendered and to express my appreciation to the various contractors for their willing coöperation in the carrying on of contract work.

Respectfully submitted,

EDWARD J. GOVERN,
Division Engineer.

THE FOLLOWING STATEMENTS SHOW THE NAME, RANK AND COMPENSATION OF ENGINEERS IN THE WESTERN DIVISION OF THE DEPARTMENT OF THE STATE ENGINEER AND SURVEYOR, TOGETHER WITH INCIDENTAL EXPENSES FOR THE FISCAL YEAR ENDED SEPTEMBER 30, 1912.

Ordinary Repairs to Canals — Erie Canal.
Chapter 810, Laws of 1911.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
Edward J. Govern.....	Division engineer.....	\$350 per month	\$4,200 00	.....	\$4,200 00
Peter Sheridan.....	Cashier.....	150 per month	641 38	.....	641 38
Joseph H. Walburn.....	Cashier.....	150 per month	1,086 21	.....	1,086 21
A. B. Williams.....	Estimate clerk.....	150 per month	1,800 00	.....	1,800 00
Anna M. Lorscheider...	Stenographer.....	100 per month	1,200 00	1,200 00
Total.....					\$8,927 59

Construction of Barge Canal — Erie Canal.
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NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
Edward J. Govern.....	Division engineer.....	\$350 per month	\$701 57	\$701 57
H. J. Knoppel.....	Supervising engineer.....	250 per month	\$2,830 65	795 77	3,626 42
George C. Mills.....	Resident engineer.....	250 per month	693 55	102 51	796 06
J. V. Hogan.....	Resident engineer.....	250 per month	876 88	57 36	934 24
C. J. McDonough.....	Resident engineer.....	250 per month	875 00	4 44	879 44
Waldo G. Wildes.....	Resident engineer.....	250 per month	665 33	86 67	752 00
George C. Andrews.....	Resident engineer.....	250 per month	411 29	32 17	443 46
B. E. Failing.....	Resident engineer.....	225 per month	2,700 00	172 30	2,872 30
O. F. Bellows.....	Resident engineer.....	225 per month	2,700 00	19 12	2,719 12
J. V. Hogan.....	Assistant engineer.....	7 00 per day	42 00	2 29	44 29
Edward Anderberg.....	Assistant engineer.....	6 00 per day	1,884 00	60 64	1,944 64
H. R. Wickham.....	Assistant engineer.....	6 00 per day	1,956 00	6 53	1,962 53
G. C. Britton.....	Assistant engineer.....	6 00 per day	1,770 00	.....	1,770 00
C. L. Baldwin.....	Assistant engineer.....	6 00 per day	1,890 00	271 13	2,161 13
A. S. Millinowski.....	Assistant engineer.....	6 00 per day	1,878 50	317 11	2,196 61
Gordon Edson.....	Assistant engineer.....	6 00 per day	1,599 00	15 15	1,614 15
C. R. Waters.....	Assistant engineer.....	6 00 per day	2,058 00	804 21	2,862 21
B. L. G. Rees.....	Assistant engineer.....	6 00 per day	1,518 00	191 42	1,709 42
J. S. Clancy.....	Assistant engineer.....	6 00 per day	906 00	.....	906 00
L. G. Fisher.....	Assistant engineer.....	6 00 per day	1,344 00	.....	1,344 00
F. C. Koerner.....	Assistant engineer.....	6 00 per day	1,818 00	29 34	1,847 34
H. J. Hemstreet.....	Assistant engineer.....	6 00 per day	678 00	3 79	681 79
E. P. Strowger.....	Assistant engineer.....	6 00 per day	1,056 00	14 98	1,070 98
A. S. Whitbeck.....	Assistant engineer.....	6 00 per day	1,500 00	16 80	1,516 80
J. S. Summers.....	Assistant engineer.....	6 00 per day	1,878 00	229 09	2,107 09
George D. Kellogg.....	Assistant engineer.....	6 00 per day	1,728 00	230 60	1,958 60
Frank T. Marsh.....	Assistant engineer.....	6 00 per day	1,800 00	168 78	1,968 78
R. H. Merrill.....	Assistant engineer.....	6 00 per day	1,640 00	350 19	1,990 19
Elias H. Anderson.....	Assistant engineer.....	6 00 per day	630 00	131 80	761 80
W. T. Huber.....	Assistant engineer.....	6 00 per day	1,890 00	200 50	2,090 50
O. L. Burdett.....	Assistant engineer.....	6 00 per day	1,878 00	191 78	2,069 78
J. V. Hogan.....	Assistant engineer.....	6 00 per day	1,020 00	130 52	1,150 52
E. C. Lawton.....	Assistant engineer.....	6 00 per day	932 00	25 55	957 55
Fred J. Wilbur.....	Assistant engineer.....	6 00 per day	1,878 00	.....	1,878 00
D. E. Bellows.....	Assistant engineer.....	6 00 per day	1,800 00	205 70	2,005 70
H. N. Metzger.....	Assistant engineer.....	6 00 per day	516 00	20 98	536 98
C. D. Murray.....	Assistant engineer.....	6 00 per day	1,944 00	129 44	2,073 44

Construction of Barge Canal — Erie Canal — (Continued).

Chapter 147, Laws of 1903, and amendatory laws.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
Carl Ashley	Assistant engineer	\$6 00 per day	\$1,890 00	\$36 02	\$1,926 02
F. W. Madigan	Assistant engineer	5 50 per day	1,874 00	133 75	2,007 75
H. N. Metzger	Assistant engineer	5 50 per day	1,366 00	55 53	1,421 53
C. E. Elmendorf	Assistant engineer	5 50 per day	1,776 50	75 47	1,851 97
Gordon Edson	Assistant engineer	5 50 per day	220 00	3 45	223 45
Ely Gamse	Assistant engineer	5 00 per day	70 00	20 71	90 71
Fred'k T. Lawton	Assistant engineer	5 00 per day	625 00		625 00
R. D. Cameron	Assistant engineer	5 00 per day	170 00		170 00
C. H. Swick	Assistant engineer	5 00 per day	615 00		615 00
George S. Haight	Assistant engineer	5 00 per day	565 00		565 00
A. P. Mumi	Assistant engineer	5 00 per day	550 00		550 00
R. C. Georger	Assistant engineer	5 00 per day	1,175 00	73 27	1,248 27
J. V. Hogan	Assistant engineer	5 00 per day	315 00	50 49	365 49
F. V. Searls	Estimate clerk	150 per month	1,800 00	177 22	1,977 22
Dora Hamilton	Confidential stenographer	125 per month	1,500 00		1,500 00
A. Edith Schoelles	Stenographer	75 per month	450 00		450 00
A. Edith Schoelles	Stenographer	60 per month	360 00		360 00
Emma M. Repp	Stenographer	75 per month	225 00		225 00
Emma M. Repp	Stenographer	60 per month	442 00		442 00
W. A. Kehoe	Chauffeur	100 per month	1,009 57	55 00	1,064 57
John J. Nugent	Chauffeur		187 10	14 90	202 00
W. H. Dornell	Draftsman	5 00 per day	600 00		600 00
A. B. Chappell	Draftsman	5 00 per day	1,580 00		1,580 00
Tracy B. Smith	Draftsman	5 00 per day	980 00		980 00
H. G. McKelvey	Draftsman	5 00 per day	650 00		650 00
Chas. R. Zorsch	Draftsman	5 00 per day	1,535 00		1,535 00
H. H. Stickney, Jr.	Draftsman	5 00 per day	1,565 00	48 81	1,613 81
H. Clyde Roe	Draftsman	5 00 per day	1,500 00	15 16	1,515 16
C. J. Alber	Draftsman	5 00 per day	1,565 00		1,565 00
H. W. Lockwood	Draftsman	5 00 per day	1,065 00		1,065 00
Jas. G. Allan	Tracer	75 per month	885 48		885 48
W. J. Burns	Tracer	75 per month	713 71		713 71
R. J. Curran	Tracer	75 per month	465 00	2 17	467 17
Ely Gamse	Leveler	5 00 per day	936 00	132 03	1,068 03
A. E. Roche	Leveler	5 00 per day	445 00		445 00
R. D. Cameron	Leveler	5 00 per day	360 00		360 00
P. L. Arnold	Leveler	5 00 per day	1,580 00		1,580 00
H. J. Simmelink	Leveler	5 00 per day	1,495 00		1,495 00
J. J. Hynes, Jr.	Leveler	5 00 per day	1,605 00	3 20	1,608 20
C. J. Bean	Leveler	5 00 per day	525 00		525 00
A. P. Mumi	Leveler	5 00 per day	1,030 00		1,080 00
J. B. Doyle	Leveler	5 00 per day	415 00		415 00
Bruce L. Hall	Leveler	5 00 per day	395 00		395 00
L. R. Barnes	Leveler	5 00 per day	880 00		880 00
C. H. Swick	Leveler	5 00 per day	1,060 00		1,060 00
George S. Haight	Leveler	5 00 per day	1,055 00		1,055 00
W. J. Willis	Leveler	4 50 per day	534 00		594 00
R. C. Georger	Leveler	4 50 per day	360 00		360 00
J. F. Back	Leveler	4 50 per day	837 00		837 00
Jacob Bendell	Leveler	4 50 per day	31 50		31 50
R. D. Cameron	Leveler	4 50 per day	526 50		526 50
J. B. Doyle	Leveler	4 50 per day	1,084 50		1,084 50
Bruce L. Hall	Leveler	4 50 per day	1,039 50		1,039 50
Burr M. Stark	Leveler	4 50 per day	684 00	2 85	686 85
J. L. Ames	Leveler	4 50 per day	630 00		630 00
L. F. Erglestone	Leveler	4 50 per day	553 00		558 00
J. H. Bovier	Rodman	4 00 per day	628 00		628 00
John Mockler	Rodman	4 00 per day	732 00		732 00
W. C. R. Pyne	Rodman	4 00 per day	748 00	33 30	781 30
Fred C. Facer	Rodman	4 00 per day	1,328 00		1,328 00
Paul A. Volcker	Rodman	4 00 per day	344 00		344 00
C. M. Colony	Rodman	4 00 per day	1,120 00		1,120 00
M. F. Dulles	Rodman	4 00 per day	1,308 00		1,308 00
T. S. Fillebrown	Rodman	4 00 per day	500 00		500 00
J. W. Howe	Rodman	4 00 per day	1,288 00		1,288 00
Benjamin Krotmeyer	Rodman	4 00 per day	700 00		700 00
J. F. Back	Rodman	4 00 per day	520 00		520 00
J. L. Ames	Rodman	4 00 per day	696 00		696 00
Walter G. Dubey	Rodman	4 00 per day	1,256 00		1,256 00
D. T. Simpson	Rodman	4 00 per day	1,264 00		1,264 00
A. A. Levison	Rodman	4 00 per day	628 00		628 00
L. P. Slade	Rodman	4 00 per day	1,252 00		1,252 00

Construction of Barge Canal — Erie Canal — (Continued).

Chapter 147, Laws of 1903, and amendatory laws.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
M. Tiefenbrum	Rodman	\$4 00 per day	\$768 00		\$768 00
W. Robinson	Rodman	4 00 per day	1,284 00		1,284 00
J. Lyons	Rodman	4 00 per day	1,268 00		1,268 00
D. M. Miner	Rodman	4 00 per day	1,276 00		1,276 00
A. A. Levison	Rodman	3 50 per day	546 00		546 00
Paul A. Volcker	Rodman	3 50 per day	854 00	\$2 85	856 85
F. M. White	Rodman	3 50 per day	1,116 50		1,116 50
T. S. Fillebrown	Rodman	3 50 per day	640 50		640 50
J. H. Bovier	Rodman	3 50 per day	570 50		570 50
John Mockler	Rodman	3 50 per day	455 00		455 00
W. C. R. Pyne	Rodman	3 50 per day	164 00	4 12	168 12
F. L. Van Patten	Rodman	3 50 per day	119 00		119 00
Leon C. Loomis	Rodman	3 50 per day	528 50		528 50
H. N. Henderson	Rodman	3 50 per day	542 50		542 50
L. F. Eggleston	Rodman	3 50 per day	224 00		224 00
J. C. Cowe	Rodman	3 50 per day	553 00		553 00
M. G. Cain	Rodman	3 50 per day	521 50		521 50
Harry Rozinski	Rodman	3 50 per day	182 00		182 00
H. J. Whitman	Rodman	3 50 per day	416 50		416 50
Fred C. Davis	Rodman	3 50 per day	427 00		427 00
John M. Barney	Rodman	3 50 per day	248 50		248 50
Frank M. Harleman	Rodman	3 50 per day	224 00		224 00
Lawrence Bentley	Rodman	3 50 per day	150 50		150 50
George Dunlop	Rodman	3 50 per day	45 50		45 50
E. L. Wick	Inspector	5 00 per day	1,665 00		1,665 00
G. M. Harris	Inspector	5 00 per day	1,645 00		1,645 00
H. B. Fintan	Inspector	5 00 per day	860 00		860 00
W. P. Lynch	Inspector	5 00 per day	1,360 00		1,360 00
Jas. Sim	Inspector	5 00 per day	650 00	7 67	657 67
W. W. Barclay	Inspector	5 00 per day	1,290 00	46 65	1,336 65
C. M. Leet	Inspector	5 00 per day	1,645 00	6 97	1,651 97
T. McMorrow	Inspector	5 00 per day	1,605 00		1,605 00
E. V. Allendorph	Inspector	5 00 per day	590 00		590 00
J. O. Donnelly	Inspector	4 50 per day	1,335 00		1,335 00
Fred'k T. Lawton	Inspector	3 50 per day	696 50		696 50
A. W. Balliett	Inspector	3 50 per day	168 00		168 00
H. B. Failing	Inspector	3 50 per day	224 00		224 00
L. H. Brandt	Inspector	3 50 per day	168 00		168 00
H. Kramer	Foreman of borings	5 00 per day	1,526 00	8 10	1,534 10
Fred H. Palmer	Foreman of borings	4 00 per day	524 00	5 06	529 06
E. H. Wetzel	Foreman of public works	5 00 per day	850 00		850 00
C. J. Lahey	Boatman	3 00 per day	939 00		939 00
Jas. A. Lair	Boatman	3 00 per day	645 00		645 00
Wm. F. Guenther	Boatman	3 00 per day	666 00		666 00
John G. Farrell	Boatman	3 00 per day	12 00		12 00
Jas. Hutt	Boatman	3 00 per day	252 00	9 10	261 10
Wm. Sterritt	Boatman	3 00 per day	306 00		306 00
Archie Ventras	Boatman	3 00 per day	267 00		267 00
David Bowes	Boatman	3 00 per day	117 00		117 00
Wm. Dwyer	Boatman	3 00 per day	312 00		312 00
E. J. Burns	Boatman	3 00 per day	594 00		594 00
R. Nichols	Boatman	3 00 per day	120 00		120 00
E. A. Faile	Boatman	3 00 per day	990 00		990 00
H. J. Whitman	Boatman	3 00 per day	192 00		192 00
Martin Scanlon	Boatman	3 00 per day	150 00		150 00
Irving Whitney	Boatman	3 00 per day	390 00		390 00
Leon Simpson	Boatman	3 00 per day	339 00		339 00
Leo Durnherr	Boatman	3 00 per day	36 00		36 00
S. Hutchinson	Boatman	3 00 per day	327 00		327 00
E. Mahorey	Boatman	3 00 per day	399 00		399 00
M. H. M. Connell	Boatman	3 00 per day	513 00	2 58	515 58
C. V. Ford	Boatman	3 00 per day	387 00		387 00
E. Haasig	Boatman	3 00 per day	171 00		171 00
Fred B. Sherman	Boatman	3 00 per day	558 00		558 00
Fred Unger	Boatman	3 00 per day	543 00		543 00
E. N. Parker	Boatman	3 00 per day	546 00		546 00
Chas. Sterling	Boatman	3 00 per day	147 00		147 00
R. N. Hale	Boatman	3 00 per day	276 00		276 00
Fred J. Converse	Boatman	3 00 per day	240 00		240 00
John M. Fagan	Boatman	3 00 per day	327 00		327 00
T. F. Moran	Boatman	3 00 per day	357 00		357 00

Construction of Barge Canal — Erie Canal — (Continued).

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NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
Frank N. Sisson.....	Chainman.....	\$3 '0 per day	\$411 00		\$411 00
C. L. Weil.....	Chainman.....	3 00 per day	489 00		489 00
Wm. H. Saunders.....	Chainman.....	3 00 per day	441 00		441 00
E. J. Greiner.....	Chainman.....	3 00 per day	951 00		951 00
J. J. Sullivan.....	Chainman.....	3 00 per day	942 00		942 00
L. H. Brandt.....	Chainman.....	3 00 per day	810 00		810 00
F. J. O'Connor.....	Chainman.....	3 00 per day	939 00		939 00
Myron Abramson.....	Chainman.....	3 0 per day	546 00		546 00
Myron A. Bantrell.....	Chainman.....	3 00 per day	285 00		285 00
S. A. Miller.....	Chainman.....	3 00 per day	963 00		963 00
F. G. Hempel.....	Chainman.....	3 00 per day	942 00		942 00
A. F. Truex.....	Chainman.....	3 00 per day	885 00		885 00
Jas. Boucher.....	Chainman.....	3 00 per day	753 00		753 00
Edward Dowd.....	Chainman.....	3 00 per day	699 00	\$9 00	708 00
C. T. Smith.....	Chainman.....	3 00 per day	486 00		486 00
Jas. Wilson.....	Chainman.....	3 00 per day	990 00		990 00
Chas. J. Donaher.....	Chainman.....	3 00 per day	669 00		669 00
H. A. Ingersoll.....	Chainman.....	3 00 per day	942 00		942 00
A. W. Balliett.....	Chainman.....	3 00 per day	843 00		843 00
Frank E. Simpson.....	Chainman.....	3 00 per day	474 00		474 00
Fred C. Davis.....	Chainman.....	3 00 per day	543 00		543 00
H. J. O'Connor.....	Chainman.....	3 00 per day	633 00		633 00
C. F. Doty.....	Chainman.....	3 00 per day	804 00		804 00
T. Beaupre.....	Chainman.....	3 00 per day	477 00		477 00
H. A. Shafer.....	Chainman.....	3 00 per day	942 00		942 00
F. G. Kimball.....	Chainman.....	3 00 per day	942 00		942 00
J. F. Webster.....	Chainman.....	3 00 per day	456 00		456 00
P. M. Howe.....	Chainman.....	3 00 per day	945 00		945 00
W. N. Whitney.....	Chainman.....	3 00 per day	393 00		393 00
W. J. Ryan.....	Chainman.....	3 00 per day	642 00		642 00
W. B. Green.....	Chainman.....	3 00 per day	501 00		501 00
L. T. Phillips.....	Chainman.....	3 00 per day	465 00		465 00
Clarence Budlong.....	Chainman.....	3 00 per day	732 00	10 25	742 25
C. H. Davy.....	Chainman.....	3 00 per day	30 00		30 00
B. Z. Wildenberg.....	Chainman.....	3 00 per day	111 00		111 00
Jas. Boucher.....	Chainman.....	3 00 per day	130 00		130 00
Edward Dowd.....	Chainman.....	2 50 per day	130 00		130 00
C. T. Smith.....	Chainman.....	2 50 per day	415 50		415 50
Wm. H. Barhyte.....	Chainman.....	2 50 per day	90 00		90 00
Wm F. Lysett.....	Chainman.....	2 50 per day	422 50		422 50
Frank E. Simpson.....	Chainman.....	2 50 per day	390 00		390 00
Fred C. Davis.....	Chainman.....	2 50 per day	65 00		65 00
George Dunlop.....	Chainman.....	2 50 per day	690 00		690 00
C. F. Doty.....	Chainman.....	2 50 per day	127 50		127 50
T. Beaupre.....	Chainman.....	2 50 per day	402 00		402 00
G. D. Wetzels.....	Chainman.....	2 50 per day	300 00		300 00
W. N. Whitney.....	Chainman.....	2 50 per day	455 00		455 00
W. J. Ryan.....	Chainman.....	2 50 per day	262 50		262 50
W. B. Green.....	Chainman.....	2 50 per day	132 50		132 50
L. T. Phillips.....	Chainman.....	2 50 per day	335 00		335 00
Ivan C. Hall.....	Chainman.....	2 50 per day	190 00		190 00
Leslie Ames.....	Chainman.....	2 50 per day	227 50		227 50
H. V. Dumont.....	Chainman.....	2 50 per day	180 00		180 00
Carl N. Backus.....	Chainman.....	2 50 per day	37 50		37 50
E. J. Bullis.....	Chainman.....	2 50 per day	310 00		310 00
F. L. Peacock.....	Chainman.....	2 50 per day	210 00		210 00
L. B. Curry.....	Chainman.....	2 50 per day	167 50		167 50
Frank N. Sisson.....	Chainman.....	2 50 per day	472 50		472 50
C. L. Weil.....	Chainman.....	2 50 per day	410 00		410 00
Wm. H. Saunders.....	Chainman.....	2 50 per day	455 00		455 00
Guy L. Smith.....	Chainman.....	2 50 per day	195 00		195 00
Finla L. Jones.....	Axeman.....	2 50 per day	830 00		830 00
George E. Merry.....	Axeman.....	2 50 per day	785 00		785 00
T. J. Smith.....	Axeman.....	2 50 per day	262 50		262 50
Lynn H. Barrows.....	Axeman.....	2 50 per day	782 50		782 50
A. C. Kenny.....	Laborer.....	2 00 per day	8 00		8 00
W. H. Kewin.....	Laborer.....	2 00 per day	624 00		624 00
Wm. Marshall.....	Laborer.....	2 00 per day	512 00		512 00
John Finnigan.....	Laborer.....	2 50 per day	150 00		150 00
C. R. Elliott.....	Laborer.....	2 00 per day	298 00		298 00
J. H. Madden.....	Laborer.....	2 00 per day	661 00		661 00

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NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
J. Westbrook	Laborer	\$2 00 per day	\$626 00		\$626 00
George R. Shea	Laborer	2 00 per day	166 00		166 00
Peter Arnold	Laborer	2 00 per day	626 00		626 00
Edward McGurn	Laborer	2 00 per day	518 00		518 00
Martin Hickey	Laborer	2 00 per day	518 00		518 00
B. A. McDonald	Laborer	2 00 per day	138 00		138 00
Patrick O'Donnell	Laborer	2 00 per day	626 00		626 00
Rendall Rhody	Laborer	2 00 per day	530 00		530 00
J. B. Roberts	Laborer	2 00 per day	626 00		626 00
H. B. Riestern	Laborer	2 00 per day	606 00		606 00
Jas. Duffy	Laborer	2 00 per day	248 00		248 00
John Rickard	Laborer	2 00 per day	30 00		30 00
George Milliner	Laborer	2 00 per day	636 00		636 00
Edward Welsh	Laborer	2 00 per day	356 00		356 00
Leo G. Cooley	Laborer	2 00 per day	626 00		626 00
A. B. Curran	Laborer	2 00 per day	450 00		450 00
John F. Carroll	Laborer	2 00 per day	544 00		544 00
H. R. Dix	Laborer	2 00 per day	308 00		308 00
Michael Unger	Laborer	2 00 per day	692 00		692 00
Wm. Harris	Laborer	2 00 per day	648 00		648 00
E. B. Male	Laborer	2 00 per day	648 00		648 00
M. H. McConnell	Laborer	2 00 per day	256 00		256 00
C. V. Ford	Laborer	2 00 per day	66 00		66 00
E. Haasig	Laborer	2 00 per day	218 00		218 00
Fred B. Sherman	Laborer	2 00 per day	288 00		288 00
Fred Unger	Laborer	2 00 per day	290 00		290 00
E. N. Parker	Laborer	2 00 per day	302 00		302 00
E. J. Burns	Laborer	2 00 per day	304 00		304 00
R. F. Nichols	Laborer	2 00 per day	238 00		238 00
H. J. Whitman	Laborer	2 00 per day	282 00		282 00
Irving Whitney	Laborer	2 00 per day	290 00		290 00
Thos. Cleary, Jr.	Laborer	2 00 per day	114 00		114 00
Geo. McFarland, Jr.	Laborer	2 00 per day	426 00		426 00
W. T. Burke	Laborer	2 00 per day	434 00		434 00
M. Kirsch	Laborer	2 00 per day	630 00		630 00
G. A. Lewis	Laborer	2 00 per day	604 00		604 00
B. McCabe	Laborer	2 00 per day	642 00		642 00
E. M. Ryan	Laborer	2 00 per day	626 00		626 00
E. C. Warren	Laborer	2 00 per day	628 00		628 00
C. L. Foster	Laborer	2 00 per day	650 00		650 00
N. J. O'Mealia	Laborer	2 00 per day	640 00		640 00
E. A. Close	Laborer	2 00 per day	660 00		660 00
E. W. Burke	Laborer	2 00 per day	644 00		644 00
R. T. Speigel	Laborer	2 00 per day	652 00		652 00
C. R. Kirby	Laborer	2 00 per day	434 00		434 00
Harry Beck	Laborer	2 00 per day	114 00		114 00
Patrick O'Brien	Laborer	2 00 per day	114 00		114 00
Wm. F. Guenther	Laborer	2 00 per day	182 00		182 00
J. Corbett	Laborer	2 00 per day	86 00		86 00
Allan T. Sinclair	Laborer	2 00 per day	438 00		438 00
F. F. Moran	Laborer	2 00 per day	64 00		64 00
Hiram J. Wolfe	Laborer	2 00 per day	314 00		314 00
C. E. Crowley	Laborer	2 00 per day	626 00		626 00
F. J. Madden	Laborer	2 00 per day	626 00		626 00
J. H. Madigan	Laborer	2 00 per day	434 00		434 00
J. E. McNulty	Laborer	2 00 per day	630 00		630 00
H. Carson	Laborer	2 00 per day	360 00		360 00
Edward T. Wells	Laborer	2 00 per day	50 00		50 00
E. L. Kelly	Laborer	2 00 per day	264 00		264 00
Irving O'Keefe	Laborer	2 00 per day	248 00		248 00
Frank Murphy	Laborer	2 00 per day	126 00		126 00
T. E. Williams	Laborer	2 00 per day	198 00		198 00
J. H. Spencer	Laborer	2 00 per day	48 00		48 00
F. B. Lent	Laborer	2 00 per day	130 00		130 00
Ira J. Foster	Laborer	2 00 per day	738 00		738 00
C. H. Schlee	Laborer	2 00 per day	676 00		676 00
Wm. A. Beal, Jr.	Laborer	2 00 per day	706 00		706 00
Richard Maxwell	Laborer	2 00 per day	688 00		688 00
Wm. A. Flynn	Laborer	2 00 per day	282 00		282 00
R. N. Hale	Laborer	2 00 per day	446 00		446 00
Joseph Berger	Laborer	2 00 per day	656 00		656 00

Construction of Barge Canal — Erie Canal — (Concluded).

Chapter 147, Laws of 1906, and amendatory laws.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
R. B. Engert.....	Laborer.....	\$2 00 per day	\$262 00		\$262 00
A. R. Payser.....	Laborer.....	2 00 per day	636 00		636 00
J. R. Brundage.....	Laborer.....	2 00 per day	46 00		46 00
Wm. A. Sullivan.....	Laborer.....	2 00 per day	578 00		578 00
J. Louis Myers.....	Laborer.....	2 00 per day	172 00		172 00
T. J. Griffin.....	Laborer.....	2 00 per day	466 00		466 00
D. Lawler.....	Laborer.....	2 00 per day	90 00		90 00
Harry E. Rose.....	Laborer.....	2 00 per day	626 00		626 00
C. Kumro.....	Laborer.....	2 00 per day	630 00		630 00
F. J. Bauman.....	Laborer.....	2 00 per day	554 00	\$3 40	557 40
Floyd M. Harris.....	Laborer.....	2 00 per day	100 00		100 00
John Ritsenthaler.....	Laborer.....	2 00 per day	458 00		458 00
Douglas Hall.....	Laborer.....	2 00 per day	462 00		462 00
J. Hart.....	Laborer.....	2 00 per day	626 00		626 00
Carl Tuscher.....	Gage reader.....	5 00 per month	60 00		60 00
Wm. Swarts.....	Gage reader.....	5 00 per month	60 00		60 00
C. Henry Harrison.....	Gage reader.....	5 00 per month	60 00		60 00
P. J. Slavin.....	Gage reader.....	5 00 per month	60 00		60 00
Jacob Snell, Jr.....	Gage reader.....	6 00 per month	72 00		72 00
					\$234,716 47
Incidental Expenses.					
Instruments, tools and appliances.....				\$301 39	
Office rent.....				4,356 18	
Fuel and light.....				562 19	
Stationery and printing.....				440 23	
Postage.....				457 08	
Telephone and telegraph.....				1,805 67	
Miscellaneous.....				22,721 14	
					30,643 88
Total.....					\$265,360 35

Repairs to Oak Orchard Feeder.

Chapter 547, Laws of 1912.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
Joseph V. Hogan.....	Assistant engineer.....	\$6 00 per day		\$23 00	\$23 00
A. S. Whitbeck.....	Assistant engineer.....	6 00 per day	\$96 00	32 00	128 00
W. J. Burns.....	Tracer.....	75 per month	87 10	16 78	97 88
Edward Dowd.....	Chainman.....	3 00 per day	48 00		48 00
Irving J. Whitney.....	Boatman.....	3 00 per day	9 00		9 00
Thos. McGrath.....	Foreman.....	3 00 per day	33 00		33 00
Thos. Collins.....	Laborer.....	2 00 per day	22 00		22 00
Michael Kearney.....	Laborer.....	2 00 per day	22 00		22 00
Jas. Allis.....	Laborer.....	2 00 per day	22 00		22 00
Jas. Wilson.....	Laborer.....	2 00 per day	22 00		22 00
Walter Linkey.....	Laborer.....	2 00 per day	22 00		22 00
Jas. Sweeney.....	Laborer.....	2 00 per day	22 00		22 00
Martin Hickey.....	Laborer.....	2 00 per day	32 00		32 00
Edward McGurn.....	Laborer.....	2 00 per day	32 00		32 00
			\$469 10	\$65 78	\$534 88
Incidental Expenses.					
Livery.....				\$30 00	
Miscellaneous.....				46 19	
					76 19
Total.....					\$611 07

Repairs to Drain at Chapel Street, Lockport.

Chapter 397, Laws of 1912.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
E. C. Lawton ..	Assistant engineer	\$6 00 per day	\$48 00	.....	\$48 00
H. A. Ingersoll	Chainman	3 00 per day	3 00	.....	3 00
Leo G. Cooley	Laborer	2 00 per day	2 00	.....	2 00
Douglas Hall	Laborer	2 00 per day	2 00	.....	2 00
Total .....	.....	.....	.....	.....	\$55 00

Surveys for State Board of Claims.

Chapter 811, Laws of 1911.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
J. S. Summers	Assistant engineer	\$6 00 per day	\$12 00	\$0 84	\$12 84
R. H. Merrill	Assistant engineer	6 00 per day	144 00	41 57	185 57
Joseph V. Hogan	Assistant engineer	7 00 per day	28 00	6 30	34 30
Frank T. Marsh	Assistant engineer	6 00 per day	84 00	3 28	87 28
George D. Kellogg	Assistant engineer	6 00 per day	18 00	6 39	24 39
B. L. G. Rees	Assistant engineer	6 00 per day	12 00	6 35	18 35
H. N. Metzger	Assistant engineer	5 50 per day	11 00	7 10	18 10
A. S. Whitbeck	Assistant engineer	6 00 per day	72 00	51 96	123 96
Bruce L. Hall	Leveler	4 50 per day	36 00	11 05	47 05
W. H. Dornell	Draftsman	5 00 per day	5 00	84	5 84
H. Clyde Roe	Draftsman	5 00 per day	75 00	.....	75 00
Tracy B. Smith	Draftsman	5 00 per day	20 00	.....	20 00
Chas. R. Zorsch	Draftsman	5 00 per day	30 00	.....	30 00
H. H. Stickney, Jr.	Draftsman	5 00 per day	5 00	2 55	7 55
W. J. Burns	Tracer	75 per month	24 19	.....	24 19
Jas. G. Allan	Tracer	75 per month	14 52	.....	14 52
C. M. Colony	Rodman	4 00 per day	188 00	10 15	198 15
Edward Dowd	Chainman	3 00 per day	48 00	15 20	63 20
Frank N. Sisson	Chainman	2 50 per day	5 00	25	5 25
I. J. Whitney	Boatman	3 00 per day	111 00	2 00	113 00
David W. Bowes	Boatman	3 00 per day	63 00	.....	63 00
Fred H. Palmer	Foreman of borings	4 00 per day	208 00	13 23	221 23
M. H. McConnell	Laborer	2 00 per day	28 00	.....	28 00
E. B. Male	Laborer	2 00 per day	4 00	25	4 25
Ira J. Foster	Laborer	2 00 per day	4 00	25	4 25
Edward McGurn	Laborer	2 00 per day	80 00	5 00	85 00
Martin Hickey	Laborer	2 00 per day	80 00	5 00	85 00
			\$1,409 71	\$189 56	\$1,599 27
			<i>Incidental Expenses.</i>		
Miscellaneous .....	.....	.....	.....	\$80 61	80 61
Total .....	.....	.....	.....	.....	\$1,679 88

Surveys, Field Notes and Manuscript Maps.

Chapter 511, Laws of 1912.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
H. J. Hemstreet.....	Assistant engineer.....	\$6 00 per day	\$48 00		\$48 00
L. G. Fisher.....	Assistant engineer.....	6 00 per day	576 00	\$5 52	581 52
Edwin Hilborn.....	Assistant engineer.....	6 00 per day	24 00	13 71	37 71
G. D. Kellogg.....	Assistant engineer.....	6 00 per day	150 00		150 00
D. E. Bellows.....	Assistant engineer.....	6 00 per day	204 00	3 65	207 65
R. D. Cameron.....	Assistant engineer.....	5 00 per day	25 00	11	25 11
H. J. Simmelink.....	Leveler.....	5 00 per day	70 00		70 00
W. J. Burns.....	Tracer.....	75 per month	75 00		75 00
W. B. Green.....	Chainman.....	3 00 per day	291 00		291 00
L. B. Curry.....	Chainman.....	2 50 per day	15 00		15 00
H. V. Dumont.....	Chainman.....	2 50 per day	30 00		30 00
P. C. Rock.....	Chainman.....	2 50 per day	227 50		227 50
L. Durnherr.....	Boatman.....	3 00 per day	291 00		291 00
C. R. Kirby.....	Laborer.....	2 00 per day	194 00		194 00
W. T. Burke.....	Laborer.....	2 00 per day	194 00		194 00
F. B. Monaghan.....	Laborer.....	2 00 per day	192 00		192 00
J. P. Lawyer.....	Laborer.....	2 00 per day	180 00	5 85	185 85
G. W. Scott.....	Laborer.....	2 00 per day	142 00	5 35	147 35
J. P. Spear.....	Laborer.....	2 00 per day	84 00	2 85	86 85
H. I. Ingersoll.....	Laborer.....	2 00 per day	118 00	9 68	127 68
W. C. Behan.....	Laborer.....	2 00 per day	130 00	3 85	133 85
Incidental Expenses.			\$3,280 50	\$50 57	\$3,311 07
Miscellaneous.....				\$185 85	185 85
Total.....					\$3,496 92

SUMMARY.

The foregoing tables are summarized as follows:

Ordinary Repairs to Canals.

1. Erie canal, chapter 810, Laws of 1911.....	\$8,927 59
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Construction of Barge Canal.

2. Erie canal, chapter 147, Laws of 1903, and amendatory laws.....	265,360 35
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Special Work.

3. Repairs to Oak Orchard feeder, chapter 547, Laws of 1912.....	611 07
4. Repairs to drain at Chapel st., Lockport, chapter 397, Laws of 1912.....	55 00

Special Surveys.

5. Surveys for Board of Claims, chapter 811, Laws of 1911.....	1,679 88
6. Surveys, field notes and manuscript maps, chapter 511, Laws of 1912.....	3,496 92

Total.....	\$280,130 81
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TABLE OF CONTRACTS COMPLETED ON THE WESTERN DIVISION DURING THE FISCAL YEAR ENDED
SEPTEMBER 30, 1912.
Construction of Barge Canal.
Chapter 147, Laws of 1903, and amendatory laws

CONTRACTOR.	Date of contract.	Character of work.	Engineer's preliminary estimate.	Contract price, as affected by alterations.	Final payment.
F. A. Maselli.....	May 3, 1905	Contract No. 6, Erie canal — Buffalo road, southwest of Rochester, to near South Greece.....	\$1,381,662 50	\$1,026,549 80	\$1,033,864 04
Thos. Crimmins Contracting Co..	Mar. 18, 1908	Contract No. 9, Erie canal — Eagle Harbor to Beal's bridge...	724,014 00	803,297 18	655,461 19

TABLE OF CONTRACTS PENDING ON THE WESTERN DIVISION, SEPTEMBER 30, 1912.
Construction of Barge Canal.
 Chapter 147, Laws of 1903, and amendatory laws.

CONTRACTOR.	Date of contract.	Character of work.	Engineer's preliminary estimate.	Contract price, as affected by alterations.	Value of work to September 30, 1912.
Great Lakes Construction Co.	Nov. 26, 1906	Contract No. 19, Erie canal — Sulphur Springs guard-lock to Ellicott creek	\$1,038,245 00	\$991,401 16	\$746,680 00
Lane Brothers Co.	April 7, 1910	Contract No. 21, Erie canal — Genesee river to near N. Y. C. R. R. bridge	1,475,900 00	1,323,150 00	751,050 00
Millard & Lupton Co.	Aug. 18, 1909	Contract No. 23, Erie canal — Kings Bend to Genesee river	2,166,600 00	1,824,388 00	1,024,280 00
United Engineering & Contracting Co.	Nov. 27, 1908	Contract No. 40, Erie canal — Locks at Lockport to Sulphur Springs guard-lock	2,516,743 00	2,252,143 80	1,738,530 00
Crowell-Sherman-Stalter Co.	Nov. 30, 1908	Contract No. 47, Erie canal — Town of Galen to Lyons	1,434,148 00	1,279,227 60	820,650 00
Crowell-Sherman-Stalter Co.	Dec. 29, 1910	Contract No. 48, Erie canal — Near N. Y. C. & H. R. R. R. crossing at Lyons to near West Shore R. R. crossing at East Newark	1,626,811 50	1,679,211 95	835,140 00
American Pipe & Construction Co.	Feb. 21, 1910	Contract No. 49, Erie canal — Palmyra to Wayne-Monroe county line	765,679 00	735,227 25	543,700 00
Empire Engineering Corporation	Aug. 6, 1908	Contract No. 60, Erie canal — Near South Greece to near Adams Basin	1,267,301 00	1,491,316 91	1,267,080 00
Cleveland & Sons Co.	Oct. 13, 1908	Contract No. 61, Erie canal — Near Adams Basin to Monroe canal — Monroe-Orleans county line to	1,000,219 00	1,080,853 35	861,570 00
I. M. Ludington's Sons, Inc.	Aug. 11, 1910	canal — Wayne-Monroe county line to	2,151,470 00	2,515,042 82	1,639,640 00
H. S. Kerbaugh, Inc.	June 3, 1910	canal — Near Prospect street, Medina,	2,184,083 00	2,349,627 46	1,421,190 00
Empire Engineering Corporation	Aug. 6, 1908	canal — Near Prospect street, Medina,	1,207,930 00	1,335,433 78	827,740 00
Empire Engineering Corporation	Sept. 22, 1908	Contract No. 66, Erie canal — Near Gasport to near locks at Lockport	751,039 00	854,393 59	704,240 00
Larkin & Sangster	Sept. 3, 1910	Contract No. 67, Erie canal — Locks at Lockport	1,290,880 00	1,208,110 00	739,440 00
United Construction Co.	Mar. 1, 1910	Canal	39,525 00	42,917 00	40,980 00
The T. A. Gillespie Co.	Dec. 23, 1910	Canal	1,504,776 00	1,512,011 15	790,570 00

TABLE OF CONTRACTS PENDING ON THE WESTERN DIVISION, SEPTEMBER 30, 1912 — (Continued).
Construction of Barge Canal — (Continued).

CONTRACTOR.	Date of contract.	Character of work.	Engineer's preliminary estimate	Contract price, as affected by alteration.	Value of work to September 30, 1912.
The T. A. Gillespie Co.....	Dec. 23, 1910	Contract No. 77, Erie canal — About one-half mile east of Port Gibson to about one-half mile west of Palmyra	\$1,790,672 00	\$1,701,807 55	\$1,176,370 00
Groton Bridge Co.	Dec. 7, 1910	Contract within 1 bridge superstructures	27,235 00	28,841 50	21,320 00
Owego Bridge Co.	May 28, 1912	Contract bridges between Lyons and Palmyra	65,116 00	59,616 00	0
Skene & Richmond... ..	April 19, 1912	Contract No. 106, Erie canal Construction of five lift bridges from Spencerport to Gasport	253,010 00	258,710 00	30,620 00

REPORT
OF THE
TERMINAL ENGINEER
ON
BARGE CANAL TERMINALS

For the Fiscal Year Ended September 30, 1912

TERMINAL ENGINEER'S REPORT.

STATE OF NEW YORK,
DEPARTMENT OF STATE ENGINEER AND SURVEYOR,
BARGE CANAL TERMINALS,
TERMINAL ENGINEER'S OFFICE.

ALBANY, *October 1, 1912.*

Hon. J. A. BENSEL, *State Engineer and Surveyor, Albany, N. Y.:*

Sir.—I have the honor to submit herewith my annual report as Terminal Engineer in the Bureau of Barge Canal Terminals, for the fiscal year ended September 30, 1912.

Chapter 746, Laws of 1911, authorizing the expenditure of \$19,800,000 in the construction of Barge Canal Terminals, having been duly approved at the election held in November, 1911, plans were at once made to carry out the provisions of said act.

About January 1, 1912, an office was opened in the city of Albany and preparations were made for obtaining the necessary engineering organization to carry on the preliminary work of surveys, investigations, estimates, etc. The progress of the work may have been somewhat slower than desired, but this has been due to a considerable extent to the usual delays in perfecting an organization, etc. The work has been divided geographically into four divisions, namely, the Southern, Eastern, Middle and Western divisions, respectively. The Southern division includes New York city and the adjacent territory, the work of this division being in charge of Mr. Carleton Greene, Division Engineer, with an office at No. 17 Battery place, New York city. The Eastern division includes that portion of the Erie canal system from the county line between Oneida and Herkimer counties easterly to Waterford and the entire Champlain canal from Waterford northerly to Whitehall, including Lake Champlain from Whitehall to Rouses Point. The work on the Eastern division is in charge of the Terminal Engineer, with an office in the

Lyon Block, Albany. The Middle division covers that portion of the Erie canal system from the line between Herkimer and Oneida counties and extends westerly to the county line between Wayne and Seneca counties, and includes also the Cayuga and Seneca canal and the Oswego canal, and is in charge of Mr. Guy L. Noble, Division Engineer, with an office at 433 South Salina street, Syracuse. The Western division includes that portion of the Erie canal beginning at the county line between Wayne and Seneca counties and extending westerly to Lake Erie, in charge of Mr. Charles J. McDonough, Resident Engineer, with an office in the Chamber of Commerce Building, Buffalo. The accounting and financial disbursements for the four divisions are handled in detail direct from the Terminal Engineer's office at Albany.

On account of the great interest manifested by the people of the various localities wherein it was proposed to locate terminals, it was decided by the State Engineer to have public hearings and meetings, so that the Department might learn at first hand the desires of the people who were interested in the development of the water-borne commerce of the State, as expected to be carried by the Barge canal. The State Engineer devoted a large amount of time and attention to personally attending the meetings throughout the state and learning for himself the desires of the people in respect to the location of terminals. The advice and suggestions thus obtained at the several localities were adopted, provided the same could be done in conformity with the law and without involving unreasonable expense or engineering features. After the approval by the Canal Board of the general location of each terminal site, detail surveys, plans and specifications were begun. Up to the end of the fiscal year the Canal Board has approved locations for terminals at the following places: Ithaca, Albany, Little Falls, Utica, Gowanus bay (South Brooklyn), Schuylerville, Schenectady, Rome, Lockport, Mechanicville, Fonda, Fort Edward, Greenpoint (North Brooklyn), Amsterdam, Erie basin (Buffalo), Herkimer, Ilion, Troy, Constantia, Syracuse, Cleveland, Watkins, Port of Call (New York city) and Dresden.

And contracts have been let for the construction of terminals at the following places: Ithaca, Albany, Little Falls, Mechanicville, Fort Edward, Schenectady and Herkimer. Plans have been completed for terminals, as follows: Gowanus bay (South Brooklyn), Whitehall, Fonda, Ilion, Amsterdam, Rome, Lockport and Utica; and partially completed for Troy and Syracuse.

No construction work has yet been done, but in all probability a start will be made this fall at the following places: Albany, Little Falls, Herkimer and Whitehall. A tabular statement, showing contracts awarded, follows:

Terminal contract No.	Location.	Name of contractor.	Amount of contract.
1.....	Ithaca.....	New York Dredging Corporation.....	\$46,464 00
2.....	Albany.....	Raymond Concrete Pile Co.....	141,382 00
3.....	Little Falls.....	Aetna Engineering & Contracting Co.....	56,361 75
5.....	Mechanicville.....	E. Brown Baker.....	55,634 00
7.....	Ft. Edward.....	Aldrich & Hall, Inc.....	39,309 00
7-A.....	Ft. Edward.....	New York State Dredging Corporation.....	109,332 00
8.....	Schenectady.....	American Pipe & Construction Co.....	166,971 00
9.....	Herkimer.....	Aetna Engineering & Contracting Co.....	73,882 00
			\$601,315 75

Plans and specifications have been completed for work, as follows:

Terminal contract No.	Location.	Engineer's estimate.
4.....	Gowanus bay (New York city).....	\$128,633
6.....	Whitehall.....	36,714
10.....	Fonda.....	58,214
11.....	Ilion.....	57,944
12.....	Amsterdam.....	64,765
15.....	Utica.....	608,071
16.....	Rome.....	91,247
17.....	Lockport.....	55,605
18.....	Gowanus bay (New York city).....	152,684
		\$1,253,911

In the preparation of terminal contracts the general plan followed has been to include in the first contracts at all locations only the necessary work of dredging harbors, constructing dock-walls and grading approaches and terminal sites. After the completion of this portion of the work, subsequent contracts will be

made for the erection of buildings and the installation of necessary handling machinery, etc. It is planned to give the matter of size and style of warehouses, handling machinery, etc., sufficient study, so that by the time it becomes necessary to provide for their construction a uniformity of design may be adopted for all buildings and equipment that will be most suitable for the class of freight to be handled at the various terminals. Such uniformity in buildings and equipment will minimize the cost of maintenance, as well as the initial cost of construction.

The detailed report of work performed on the four divisions follows:

SOUTHERN DIVISION.

Work on this division has included preliminary surveys, borings, etc., covering sites for terminals at Gowanus bay, Newtown creek, and Port of Call (North river), together with preliminary investigations, covering several of the other proposed terminal sites. Contract plans have been completed for part of the proposed terminal at Gowanus bay and those for the improvement at Greenpoint are well under way.

EASTERN DIVISION.

Preliminary surveys, borings and maps have been made for terminals at the following places: Albany, Troy, Schenectady, Mechanicville, Ft. Edward, Schuylerville, Whitehall, Port Henry, Plattsburg, Rouses Point, Amsterdam, Fonda, Fort Plain, Little Falls, Herkimer, Ilion and Frankfort. Contract plans have been completed and the work placed under contract at the following places: Albany, Little Falls, Mechanicville, Ft. Edward, Schenectady and Herkimer. There are under advertisement at the present time terminals at Whitehall, Fonda, Ilion and Amsterdam. Plans in the course of preparation include terminals at Troy and Fort Plain, together with preliminary studies of work at Port Henry, Plattsburg and Rouses Point. Surveys and maps of land to be appropriated for terminal work have been made at Albany, Troy, Schenectady, Mechanicville, Fort Edward, Little Falls and Herkimer.

MIDDLE DIVISION.

On this division preliminary surveys, borings and maps have been made covering the terminal sites at Utica, Syracuse, Ithaca, Oswego, Cleveland and Constantia. Contract plans have been completed for terminals at Rome and Ithaca, and partially completed for the work at Utica, Syracuse and Oswego. The Ithaca terminal has been placed under contract, but no construction work started.

WESTERN DIVISION.

The work performed on this division has consisted of preliminary surveys and preparation of plans and estimates for terminals at Lockport, and Erie and Ohio basins at Buffalo. The Lockport plans have been completed and advertisement of same is under way. Surveys and maps have been made of land to be appropriated for terminal purposes at Lockport and Erie basin (Buffalo).

There is appended hereto a table showing the engineering expenses for the fiscal year ended September 30.

Respectfully submitted,

JOHN A. O'CONNOR,
Terminal Engineer.

THE FOLLOWING STATEMENTS SHOW THE NAMES, RANK AND COMPENSATION OF ENGINEERS EMPLOYED ON THE CONSTRUCTION OF BARGE CANAL TERMINALS IN THE DEPARTMENT OF THE STATE ENGINEER AND SURVEYOR, TOGETHER WITH INCIDENTAL EXPENSES, FOR THE FISCAL YEAR ENDED SEPTEMBER 30, 1912.

Construction of Barge Canal Terminals — Head Office Account.

Chapter 746, Laws of 1911.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
J. A. O'Connor.....	Terminal engineer.....	\$6,000 per year	\$4,500 00	\$864 50	\$5,364 50
H. O. Schermerhorn....	Resident engineer.....	250 per month	2,000 00		2,000 00
John R. Baxter.....	Supervising engineer.....	250 per month	125 00	13 30	138 30
Fred C. Stahl.....	Bookkeeper.....	100 per month	688 71	40	689 11
William S. Ward.....	Correspondence clerk.....	100 per month	804 15	20	804 35
John A. Murray.....	Stenographer.....	83 33 per month	499 98		499 98
M. J. Sullivan.....	Stenographer.....	83 33 per month	648 12		648 12
F. B. Holmes.....	Engineering draftsman.....	5 00 per day	135 00	3 34	138 34
A. C. Richards.....	Assistant engineer.....	6 00 per day	54 00	5 40	59 40
W. A. Treadwell.....	Assistant engineer.....	6 00 per day	126 00	24 85	150 85
G. G. Underhill.....	Assistant engineer.....	7 00 per day	960 00	19 10	979 10
L. Greenalch.....	Rodman.....	3 50 per day	581 00	1 65	582 65
L. Y. Meneely.....	Rodman.....	4 00 per day	32 00		32 00
H. J. Richardson.....	Rodman.....	4 00 per day		21 96	21 96
H. F. Eagan.....	Chainman.....	3 00 per day	27 00	2 68	29 68
W. H. Culnan.....	Laborer.....	2 00 per day	24 00		24 00
E. H. Fitzpatrick.....	Laborer.....	2 00 per day	288 00		288 00
Joseph W. Habbinger.....	Laborer.....	2 00 per day	288 00		288 00
Daniel Hartnett.....	Laborer.....	2 00 per day	104 00		104 00
Hugh McCann.....	Laborer.....	2 00 per day	302 00		302 00
John A. McCurdy.....	Laborer.....	2 00 per day	288 00		288 00
H. F. McGowen.....	Laborer.....	2 00 per day	236 00		236 00
Leonard Paige.....	Laborer.....	2 00 per day	182 00	17 60	199 60
Harvey W. Nutter.....	Chauffeur.....	100 per month	350 00	86 15	436 15
			\$13,242 96	\$1,061 13	\$14,304 09
<i>Incidental Expenses.</i>					
Instruments, tools and appliances.....				\$148 66	
Office rent.....				746 72	
Fuel and light.....				16 30	
Stationery and printing.....				2,561 70	
Postage.....				71 48	
Telephone and telegraph.....				161 52	
Express and freight.....				42 19	
Miscellaneous.....				5,799 77	
					9,548 34
Total.....					\$23,852 43

Construction of Barge Canal Terminals — Eastern Division Account.

Chapter 746, Laws of 1911.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
H. O. Schermerhorn....	Resident engineer.....	\$250 per month		\$5 50	\$5 50
W. H. Dornell.....	Engineering draftsman.....	5 00 per day	\$595 00	11 07	606 07
J. E. Hall.....	Engineering draftsman.....	5 00 per day	180 00		180 00
F. B. Holmes.....	Engineering draftsman.....	5 00 per day	780 00	7 68	787 68

*Construction of Barge Canal Terminals — Eastern Division
Account — (Concluded).*

Chapter 746, Laws of 1911

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
A. J. Griffin.....	Tracer.....	\$60 per month	\$92 90		\$92 90
J. B. Maguire.....	Assistant engineer.....	6 00 per day	1,248 00	\$1,345 29	2,593 29
A. C. Richards.....	Assistant engineer.....	6 00 per day	936 00	12 70	948 70
E. W. Sylvester.....	Assistant engineer.....	6 00 per day	186 00		186 00
W. A. Treadwell.....	Assistant engineer.....	6 00 per day	1,254 00	4 20	1,258 20
F. J. Doerhoefer.....	Leveler.....	5 00 per day	1,040 00	145 39	1,185 39
H. J. Stabile.....	Leveler.....	5 00 per day	800 00	1,048 76	1,848 76
L. Greenalch.....	Rodman.....	3 50 per day	178 50		178 50
Nathan Levy.....	Rodman.....	3 50 per day	129 50		129 50
L. Y. McNecley.....	Rodman.....	4 00 per day	204 00		204 00
H. J. Richardson.....	Rodman.....	4 00 per day	28 00	44 50	72 50
H. F. Eagan.....	Chainman.....	3 00 per day	624 00		624 00
J. H. McEntee.....	Chainman.....	2 50 per day	437 50	2 65	440 15
J. J. Taney.....	Chainman.....	2 50 per day	87 50	4 37	91 87
G. D. Wetsel.....	Chainman.....	3 00 per day	376 00	5 83	381 83
Luke A. Halpin.....	Boatman.....	3 00 per day	33 00		33 00
Edward Harrigan.....	Boatman.....	3 00 per day	78 00		78 00
Francis I. Kelly.....	Boatman.....	3 00 per day	471 00	21 50	492 50
Thomas A. Kelly.....	Boatman.....	3 00 per day	471 00		471 00
J. P. King.....	Boatman.....	3 00 per day	78 00		78 00
Leonard Paige.....	Boatman.....	3 00 per day	471 00		471 00
E. J. Palmer.....	Boatman.....	3 00 per day	393 00		393 00
Ambrose Adair.....	Laborer.....	2 00 per day	40 00		40 00
Tim Connors.....	Laborer.....	2 00 per day	48 00		48 00
Wm. H. Culnan.....	Laborer.....	2 00 per day	78 00		78 00
John Dempsey.....	Laborer.....	2 00 per day	102 00		102 00
J. J. Duffy.....	Laborer.....	2 00 per day	104 00		104 00
Harold Elmendorf.....	Laborer.....	2 00 per day	150 00		150 00
Hugh Elmendorf.....	Laborer.....	2 00 per day	150 00		150 00
E. H. Fitzpatrick.....	Laborer.....	2 00 per day	128 00		128 00
A. H. Gleason.....	Laborer.....	2 00 per day	158 00		158 00
Joseph W. Habbinger.....	Laborer.....	2 00 per day	26 00		26 00
Wm. A. Hickey.....	Laborer.....	2 00 per day	348 00		348 00
James Hopkins.....	Laborer.....	2 00 per day	182 00		182 00
William Hoy.....	Laborer.....	2 00 per day	52 00		52 00
Ralph J. Kelly.....	Laborer.....	2 00 per day	136 00		136 00
H. W. Koreman.....	Laborer.....	2 00 per day	416 00		416 00
Aaron Mathias.....	Laborer.....	2 00 per day	408 00		408 00
John A. McCurdy.....	Laborer.....	2 00 per day	128 00		128 00
Wm. McDermott.....	Laborer.....	2 00 per day	338 00		338 00
Philip Montana.....	Laborer.....	2 00 per day	182 00		182 00
John J. Nurney.....	Laborer.....	2 00 per day	302 00		302 00
H. C. Parke.....	Laborer.....	2 00 per day	50 00		50 00
Homer Rexford.....	Laborer.....	2 00 per day	182 00		182 00
James F. Smith.....	Laborer.....	2 00 per day	376 00		376 00
Howard Stott.....	Laborer.....	2 00 per day	112 00		112 00
Wm. J. Sullivan.....	Laborer.....	2 00 per day	216 00		216 00
Gilbert Vantor.....	Laborer.....	2 00 per day	190 00		190 00
John G. Walsh.....	Laborer.....	2 00 per day	110 00		110 00
S. B. Warner.....	Laborer.....	2 00 per day	132 00		132 00
H. Kramer.....	Foreman of borings.....	5 00 per day	125 00		125 00
Joseph W. Habbinger.....	Janitor.....	1 00 per day	84 00		84 00
			\$16,224 90	\$2,659 44	\$18,884 34
<i>Incidental Expenses.</i>					
Instruments, tools and appliances.....				\$215 45	
Stationery and printing.....				329 92	
Postage.....				40	
Freight and express.....				88 55	
Miscellaneous.....				834 63	
					1,468 95
Total.....					\$20,353 29

Construction of Barge Canal Terminals — Southern Division Account.

Chapter 746, Laws of 1911.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
Carleton Greene.....	Division engineer.....	\$333 33 per month	\$2,833 30	\$86 65	\$2,919 95
Carleton Greene.....	Resident engineer.....	250 per month	125 00		125 00
James E. Stewart.....	Clerk.....	100 per month	637 50		637 50
S. R. Bellows.....	Assistant engineer.....	6 00 per day	1,338 00	119 43	1,457 43
S. E. Bretthaimer.....	Assistant engineer.....	5 00 per day	365 00		365 00
L. T. Howard.....	Assistant engineer.....	6 00 per day	978 00	159 75	1,137 75
S. R. Bellows.....	Leveler.....	5 00 per day	30 00		30 00
Jacob Bendel.....	Leveler.....	5 00 per day	807 00		807 00
S. E. Bretthaimer.....	Leveler.....	5 00 per day	290 00		290 00
J. B. Doughty.....	Leveler.....	5 00 per day	1,016 00		1,016 00
J. P. Byrne.....	Rodman.....	3 50 per day	612 50		612 50
F. Leiser, Jr.....	Rodman.....	4 00 per day	713 50		713 50
S. B. Sheridan.....	Rodman.....	4 00 per day	244 00		244 00
Edward Bauch.....	Boatman.....	3 00 per day	579 00		579 00
Robert Brenner.....	Boatman.....	3 00 per day	540 00		540 00
John J. Casey.....	Boatman.....	3 00 per day	579 00		579 00
Andrew Corcoran.....	Boatman.....	3 00 per day	291 00		291 00
James Curtis.....	Boatman.....	3 00 per day	630 00		630 00
Luke A. Halpin.....	Boatman.....	3 00 per day	75 00		75 00
William L. Kelly.....	Boatman.....	3 00 per day	312 00		312 00
Charles Krantz.....	Boatman.....	3 00 per day	84 00		84 00
John J. McMahon.....	Boatman.....	3 00 per day	354 00		354 00
Peter Shine.....	Boatman.....	3 00 per day	594 00		594 00
Tim Connors.....	Laborer.....	2 00 per day	50 00		50 00
Andrew Corcoran.....	Laborer.....	2 00 per day	120 00		120 00
William L. Kelly.....	Laborer.....	2 00 per day	250 00		250 00
Daniel Leddy.....	Laborer.....	2 00 per day	206 00		206 00
George L. McCarthy.....	Laborer.....	2 00 per day	62 00		62 00
John J. McMahon.....	Laborer.....	2 00 per day	150 00		150 00
Patrick Shannon.....	Laborer.....	2 00 per day	384 00		384 00
			\$15,249 80	\$365 83	\$15,615 63
<i>Incidental Expenses.</i>					
Instruments, tools and appliances.....				\$293 47	
Office rent.....				2,000 00	
Stationery and printing.....				98 33	
Postage.....				25 57	
Telephone and telegraph.....				115 67	
Express and freight.....				27 36	
Miscellaneous.....				1,880 89	
					4,441 29
Total.....					\$20,056 92

Construction of Barge Canal Terminals — Middle Division Account.

Chapter 746, Laws of 1911.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
Guy L. Noble.....	Division engineer.....	\$333 33 per month	\$2,609 17	\$52 93	\$2,662 10
L. D. Brownell.....	Resident engineer.....	250 per month	2,137 09	49 12	2,186 21
L. A. Burns.....	Resident engineer.....	250 per month	1,316 66	146 75	1,463 41
John R. Baxter.....	Supervising engineer.....	250 per month	2,000 00	28 83	2,028 83
Harry J. Furlong.....	Stenographer.....	75 per month	397 50		397 50
W. H. Dernell.....	Engineering draftsman.....	5 00 per day	390 00		390 00
H. W. Henderson.....	Engineering draftsman.....	4 00 per day	84 00		84 00
F. B. Holmes.....	Engineering draftsman.....	5 00 per day	265 00		265 00
A. G. Card.....	Assistant engineer.....	6 00 per day	883 00	29 31	912 31

Construction of Barge Canal Terminals — Middle Division
Account — (Concluded).

Chapter 746, Laws of 1911.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
F. S. Crowell.....	Assistant engineer.....	\$6 00 per day	\$864 00		\$864 00
D. W. Overrocker.....	Assistant engineer.....	6 00 per day	1,056 00	\$285 15	1,341 15
A. C. Richards.....	Assistant engineer.....	6 00 per day	324 00		324 00
E. A. Dollard.....	Leveler.....	5 00 per day	910 50	107 18	1,017 68
I. H. Smallwood.....	Leveler.....	5 00 per day	785 00		785 00
F. A. Gordon.....	Rodman.....	4 00 per day	680 00		680 00
J. E. Smith.....	Chainman.....	3 00 per day	609 00		609 00
John J. Taney.....	Chainman.....	2 50 per day	87 50	3 36	90 86
G. D. Wetsel.....	Chainman.....	3 00 per day	81 00		81 00
P. F. Hadser.....	Boatman.....	3 00 per day	327 00		327 00
W. J. Keefe, Jr.....	Boatman.....	3 00 per day	327 00		327 00
C. Ottmer.....	Boatman.....	3 00 per day	273 00		273 00
John Seigrist, Jr.....	Boatman.....	3 00 per day	471 00		471 00
Harvey Abrams.....	Laborer.....	2 00 per day	342 00		342 00
Willis M. Brewer.....	Laborer.....	2 00 per day	154 00		154 00
Michael Burke.....	Laborer.....	2 00 per day	78 00		78 00
Walter Donnelly.....	Laborer.....	2 00 per day	148 00		148 00
Joseph Donovan.....	Laborer.....	2 00 per day	78 00		78 00
E. P. Dunn.....	Laborer.....	2 00 per day	24 00		24 00
I. Goldbas.....	Laborer.....	2 00 per day	310 00		310 00
George Leary.....	Laborer.....	2 00 per day	150 00		150 00
Wm. Muldoon.....	Laborer.....	2 00 per day	78 00		78 00
Daniel Scanlon.....	Laborer.....	2 00 per day	97 00		97 00
George Tucker.....	Laborer.....	2 00 per day	154 00		154 00
J. C. Podmore.....	Bridge designer.....	175 per month	606 67		606 67
H. W. Stoneburg.....	Foreman of borings.....	4 00 per day	628 00	48 23	676 23
			\$19,725 09	\$750 86	\$20,475 95
<i>Incidental Expenses.</i>					
Instruments, tools and appliances.....				\$318 34	
Office rent.....				925 86	
Fuel and light.....				3 67	
Stationery and printing.....				98 57	
Postage.....				15 25	
Telephone and telegraph.....				165 34	
Express and freight.....				99 17	
Miscellaneous.....				1,207 80	
					2,833 93
Total.....					\$23,309 88

Construction of Barge Canal Terminals — Western Division
Account.

Chapter 746, Laws of 1911.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
C. J. McDonough.....	Resident engineer.....	\$250 per month	\$2,125 00	\$28 93	\$2,153 93
E. McDonough.....	Temporary stenographer.....	50 per month	50 00		50 00
H. R. Norvell.....	Bookkeeper.....	100 per month	100 00		100 00
A. O. Peabody.....	Engineering draftsman.....	4 00 per day	792 00		792 00
I. L. Stalker.....	Tracer.....	75 per month	525 00		525 00
Elias H. Anderson.....	Assistant engineer.....	6 00 per day	1,248 00	69 10	1,317 10
J. S. Clancy.....	Assistant engineer.....	6 00 per day	330 00	8 73	338 73
Elwin G. Speyer.....	Assistant engineer.....	6 00 per day	1,050 00		1,050 00
C. J. Bean.....	Leveler.....	5 00 per day	1,040 00		1,040 00
Joseph Boscaglia.....	Boatman.....	3 00 per day	75 00		75 00
Thomas F. Burns.....	Boatman.....	3 00 per day	195 00		195 00

Construction of Barge Canal Terminals — Western Division
Account — (Concluded).

Chapter 746, Laws of 1911.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
D. J. Cunningham	Boatman	\$3 00 per day	\$282 00		\$282 00
Stephen McQuade	Boatman	3 00 per day	489 00		489 00
Martin J. Pierrall	Boatman	3 00 per day	585 00		585 00
T. J. Reardon	Boatman	3 00 per day	360 00		360 00
James T. Regan	Boatman	3 00 per day	489 00		489 00
Charles F. Tatu	Boatman	3 00 per day	465 00		465 00
F. W. Theobald	Boatman	3 00 per day	273 00		273 00
Charles Wilson	Boatman	3 00 per day	471 00		471 00
Joseph Boscaglia	Laborer	2 00 per day	276 00		276 00
Thomas F. Burns	Laborer	2 00 per day	172 00		172 00
Ernest J. Cutman	Laborer	2 00 per day	92 00		92 00
J. G. Farrell	Laborer	2 00 per day	52 00		52 00
George Goets	Laborer	2 00 per day	368 00		368 00
Harry Loop	Laborer	2 00 per day	204 00		204 00
T. J. Smith	Axeman	2 50 per day	127 50		127 50
			\$12,235 50	\$106 76	\$12,342 26
<i>Incidental Expenses.</i>					
Instruments, tools and appliances				\$177 64	
Office rent				932 91	
Stationery and printing				11 06	
Postage				12 58	
Telephone and telegraph				59 51	
Express and freight				36 59	
Miscellaneous				590 28	
					1,810 56
Total					\$14,152 82

SUMMARY OF SERVICES, TRAVEL AND ALL OTHER EXPENSES.
Construction of Barge Canal Terminals.
Chapter 746, Laws of 1911.

DIVISION.	Services.	Travel.	Instruments, tools and appliances.	Office rent.	Fuel and light.	Stationery and printing.	Postage.	Telephone and telegraph.	Freight and express.	Miscel- laneous.	Total.
Head office.....	\$13,242 96	\$1,061 13	\$148 66	\$746 72	\$16 30	\$2,561 70	\$71 48	\$161 52	\$42 19	\$5,799 77	\$23,852 43
Eastern division.....	16,224 90	2,659 44	215 45	.....	.....	329 92	40	.....	88 55	834 63	20,353 29
Southern division.....	15,249 80	365 83	293 47	2,000 00	.....	98 33	25 57	115 67	27 36	1,880 89	20,056 92
Middle division.....	19,725 09	750 86	318 34	925 86	3 60	98 57	15 25	165 34	99 17	1,207 80	23,309 88
Western division.....	12,235 50	106 76	177 64	932 91	.....	11 05	12 58	59 51	36 59	580 28	14,152 82
Totals.....	\$76,678 25	\$4,944 02	\$1,153 56	\$4,605 49	\$19 90	\$3,099 57	\$125 28	\$502 04	\$293 86	\$10,303 37	\$101,725 34

Report of Tests

Report of the Land Bureau

REPORT OF TESTS.

TESTING LABORATORY — STATE HALL.

ALBANY, N. Y., *October 1, 1912.*

Hon. JOHN A. BENSEL, *State Engineer and Surveyor:*

Sir.—I have the honor to submit the following report of the work of the testing laboratory of your Department for the fiscal year ended September 30, 1912.

The work of the year has been more than simply routine, and, besides the regular testing of cements, tests are now being made of sand, gravel and concrete, as well as cements; field inspection of concrete materials is also being made. Many special tests of considerable variety have made the work of particular interest and value. The inspection of cement at the mills has greatly increased the work of the bureau.

CEMENT TESTS.

The routine work of testing cement has been large during the past year, because of the great amount of work being done upon the Barge canal and upon the public highways. The method of coöperation in making tests, as tried last year with the Highway Commission, resulted in the Commission again placing the necessary number of men in this laboratory to make the tests on cement proposed for use on highways. The supervision of their work was left with the undersigned. The work done also includes, as for several years past, a large number of tests made for work under the direction of the State Architect. Although the laboratory has been enlarged several times, the work at times required the full capacity of the laboratory, especially when field work was in full swing during the summer months. The reports of tests made do not include those made by the representatives of the Department of Highways.

During the past year there have been submitted to this laboratory for tests 405 lots of cement samples, consisting of a total of 7,753 samples. These samples represented 567,420 barrels of cement, of which 97.2 per cent were for the Barge canal and 2.8 per cent were for the State Architect.

The inspection of cement at the mill permits the taking of a smaller proportion of samples to the number of barrels represented. The larger part of the work is through mill inspection, for, of the total number of barrels of cement tested, only 1,570 barrels were tested for the Barge canal after delivery upon the work.

Each sample submitted, mixed in the proportion of one part cement to three parts standard quartz sand, was tested for tensile strength at the ends of 7 and 28 days. In addition to the tests for tensile strength, each lot of samples was given tests for fineness and grinding, for initial and hard sets, for specific gravity and for soundness by means of the steam tests, the normal-water test and the normal-air test. Frequently the cements are completely analyzed and are especially checked for sulphuric anhydride (S O_2) and magnesia (Mg O).

The method of testing is practically that recommended by the American Society of Civil Engineers. The method of analysis used is that recommended by the committee of the New York Section — Society for Chemical Industry.

At the end of the 7-day tests, all results obtained on tests of samples of cement proposed for use on Barge canal work are reported to Mr. Alexander E. Kastl, Special Deputy State Engineer, and, if thought best, are held for the 28-day tests, the lots being accepted or rejected according as the results show that the cement passes or fails in the tests. The reports of all tests of cement for all other work (except Barge canal and highway work) are submitted to the Deputy State Engineer, Arnold G. Chapman. All reports of tests for the Highway Commission are made to the Engineer in charge of the Bureau of Research.

Our method of testing each sample separately for tensile strength has proven very satisfactory; in fact, by means of it, much poor cement has been discovered which would have stood the

tests, had all of the samples of the lot been blended. This method, however, makes necessary a larger equipment and a more complete system of operation than is necessary under the general method of testing a blended sample. The effort has been made to maintain as complete a laboratory with as little expense as possible; and it has been acknowledged that the laboratory and its results are so complete as to be placed by experts as being among the best in the country.

The specifications for cement follow closely those recommended by the American Society for Testing Materials — varying from them only in some minor details.

Of the cement tested and proposed for use, all was Portland cement. The brands represented are about the same as heretofore and consist of 22 American Portland cements. Of the brands, 6 were manufactured in New York, 13 in Pennsylvania, and 3 in New Jersey. Sixty-one per cent of all cement tested was made in New York state.

During the year 102 series of other cement tests were made. For these about 2,000 briquettes were made. In September an auto-clave was added to the equipment of the laboratory and series of tests were started to ascertain the value of the test now known as the "Auto-clave test."

Mill Inspection.

In addition to the regular method of sampling, as already described in this report, it has been found advisable to sample cement proposed for use on the Barge canal, at the various mills. When there is enough cement to warrant doing so, an inspector is sent to a cement mill to sample cement and inspect shipments. The plan of coöperation with the Highway Department enables the use of inspectors of either department and inspection is thus possible for both departments at less cost to each. The method of carrying on this work is as follows: The inspector takes samples from the various parts of the bin; each sample is shipped to the Testing Laboratory at Albany by the same method as described and also is tested in the same way. The endeavor is to

obtain from the sampling and the testing of these samples the "run of the product." As soon as the samples are taken the inspector places the bin of cement under the seal of this Department and the bin is so sealed that no cement can be added to or taken from it without the breaking of the seal. When the results of the tests have been secured, the reports are made in the usual way, and then, if the cement is accepted, the bin of cement is assigned to the contract which may have placed an order for the cement. When the contractor needs cement, the inspector at the mill breaks the seal on the bin, inspects the loading of the car or cars, seals these with the Department seal and then reseals the bin of cement. A notice of shipment is forwarded to the laboratory and the resident engineer in charge of the contract to which the cement has been assigned. When the car or cars arrive on the work, the seal of the Department must be broken by the resident engineer or his representative, otherwise the lot of cement must be sampled and tested in the usual way.

The work of inspection at the mill has added very considerably to the work of the Testing Laboratory. All but 2.6 per cent of the cement tested was sampled at the mill. An average of five inspectors is continually engaged in taking these samples and inspecting shipments.

SAND TESTS.

The importance of thorough examination and tests of the sands proposed for use on the Barge canal has been practically demonstrated. Fifty-one samples of sand and gravel have been tested along the lines of tests established during the previous year. These tests are as follows: The sands are examined under the microscope for those elements that give the sand its characteristics. The other tests are for voids, loams, fineness, or grading, and tensile strength with cement. The latter are made from the sand in its natural condition and also washed; and the cement is a "standard" cement, made by mixing together in the laboratory several brands of cement which run nearly alike in the regular tests. All

tests for tensile strength cover at least 28 days, but many long-time tests are being carried. Considerable attention has been given to the methods used in making the tests and it is believed that they are the most accurate that can be employed.

The "testing of sand" also includes the testing and examination of substitutes for sand, such as screenings and iron ore tailings.

CONCRETE TESTS.

In July, 1912, a hydraulic compression machine with a capacity of 200,000 pounds was placed in the laboratory. Six-inch cubes or cylinders of eight inches diameter and sixteen inches long can be tested in this machine. The Division Engineers were notified by Mr. Alexander E. Kastl, Special Deputy State Engineer, that engineers in charge of work could take advantage of this machine and from time to time makes cubes of the concrete as it was being placed in the work. The plan is to mould the test piece from concrete mixed by the contractor for actual use in the work, keep it covered with a moist canvas for seven days, then allow it to be exposed under regular atmospheric conditions until the block is twenty-one days old, when it is crated and sent to the laboratory for tests. The tests are made on the blocks when twenty-eight days old. The blocks are made in duplicate at least. Several engineers took speedy advantage of this opportunity and, during the month of September, 21 series of tests and a total of 55 concrete cubes were tested.

OTHER TESTS.

Besides those already reported, there have been made a large variety of other tests and analyses. Among the materials thus examined were lime, stone, loam, wooden paving blocks, water-proofings, wood preservatives and paints. A series of oil-mortar tests were completed.

In addition to directing the work of the laboratory and mill inspection, the undersigned has made field inspection of the con-

crete and concrete materials being used on all the Barge Canal contracts where concrete was being placed. Several contracts were visited several times. Particular attention was given to the source of supply of the gravels, sands and stones being used in the concrete. A more definite knowledge is thus gained than is often possible through a laboratory sample, but with both tests and field inspections absolute knowledge is gained. Inspection of its actual use is also a help in considering the points of merit or demerit in the material.

Respectfully submitted,

RUSSELL S. GREENMAN,
Resident Engineer in charge of Tests.

Report of the Land Bureau of the State Engineer's Department.

ALBANY, N. Y., October 1, 1912.

Hon. JOHN A. BENSEL, *State Engineer and Surveyor*:

Sir.—I have the honor to present herewith a report on the various matters pertaining to the Land Bureau of your Department for the fiscal year ended September 30, 1912.

The Commissioners of the Land Office have applications for grants of land under water which are referred to this Department for examination and report; as are also a large number of miscellaneous matters relating to State lands. These matters require careful inspection and naturally consume a great deal of time.

The maps are examined to determine their correctness and proper form, both from an engineering standpoint and to insure their conformity to the rules and regulations of the Land Office. In some cases it is also necessary to visit and inspect the locations of the proposed grants to decide as to the advisability of making the grants on the lines of the application, or, if necessary, to have them modified. It is also at times deemed advisable to deny some of these applications on account of interference with navigation or with the rights of the public. Some applications were contested or had remonstrances filed against them, and hearings have been necessary to determine the rights of the several interested parties and report the outcome to the Commissioners of the Land Office.

There have been made in this Department, for the use of the State Engineer and Surveyor and the Commissioners of the Land Office, maps showing all the lands under water granted by the Commissioners of the Land Office and the Legislature. These maps are brought up to date and are of great value for reference in adjusting land grants.

Twenty-four applications for grants of land under water were considered by this Department during the year. Two were for railroad purposes and the remainder for restricted beneficial enjoy-

ment. The lands were in the following counties: Erie, Kings, Nassau, Niagara, Queens, Rensselaer, Richmond, Suffolk and Westchester.

The State Engineer and Surveyor has sold at public auction all of those unappropriated lands of the State which have been ordered to be sold by the Commissioners of the Land Office. The records of the office show that there were held during the year fourteen public auctions, at which seventeen parcels of land were sold. The sum of \$5,617.50 was realized therefrom. Of these lands eleven parcels were acquired through the Comptroller's tax sales, four from foreclosure of loan mortgages and two from resale of bonded lands. The lands are located in the following counties: Clinton, Erie, Kings, Madison, New York, Oswego, Richmond, Schuyler, St. Lawrence and Ulster.

There has been the usual amount of correspondence and answering of inquiries from surveyors, lawyers and others on matters pertaining to the original maps and descriptions of the Colonial and early State surveys filed in this office. The answering of such inquiries often requires much study and time, as there are frequently more than one survey of the same land made at different times by various surveyors, and none should be overlooked. These maps become more valuable as time passes; and as a large part of them are very old and describe lines of tracts of lands which have become, in many instances, the boundaries of towns and counties, the value of these records becomes still greater.

For better preserving these records they have been rearranged, placed in bound volumes and indexed for convenience of reference. That it is the proper method for the care of these valuable papers and that it affords greater facility of finding particular papers with the certainty that none have been overlooked, has already been fully demonstrated.

Respectfully,

MERRITT PECKHAM, JR.,

Land Clerk.

Report on the Examination

OF THE

New York and New Jersey Boundary Line

REPORT.

STATE OF NEW YORK,
DEPARTMENT OF STATE ENGINEER AND SURVEYOR,
EASTERN DIVISION.

ALBANY, *December 9, 1912.*

HON. J. A. BENSEL, *State Engineer and Surveyor, Albany, N. Y.:*

Dear Sir.—I hand you herewith a joint report submitted by O. F. Lewis, representing the State of New York, and Charles Hopper, representing the State of New Jersey, on the inspection made of the New York and New Jersey boundary line, together with a table which has been prepared in this office, showing the locations, etc., of the various monuments.

Very truly yours,

D. B. LA DU,

Division Engineer.

Joint Report of the Engineers on the Examination of the Monuments Marking the Boundary Line between the States of New York and New Jersey.

We, the undersigned engineers, appointed by our respective State officials to coöperate in the examination of the monuments marking the boundary line between the states of New York and New Jersey, have the honor to submit this our joint report.

The monuments marking that part of the New York and New Jersey boundary line lying across lands under water in Raritan bay consist of the Romer beacon or lighthouse, the Permanent monument, the Great Beds lighthouse and the Morgan range beacon.

The range monuments marking that part of the New York and New Jersey boundary line lying across lands under water in Arthur Kill and the Kill von Kull have the tops dressed eight inches by eight inches in cross-section and for a distance down of about eight inches. On the north face generally of each are cut the letters "N. Y." and "N. J.," and on the south, or opposite face, the letters "B. M." (meaning "Boundary Monument") and the figures "1889." One-quarter-inch grooves are cut at right angles across the top, parallel with the sides, one groove entirely across the top and the other only partially across. They project about four to eight inches above ground.

The monuments marking that part of the New York and New Jersey boundary line extending from the Hudson river to the Delaware river may be divided into five classes and consist, first, of the original mile monuments erected in 1774; second, the new mile monuments; third, the Railroad monuments; fourth, the Wagon Road monuments; and fifth, the Terminal and Witness monuments, all of which were set by the Joint Commission in 1882, except the original monuments of 1774, which were reset, when necessary, by said Commission at said time.

The monuments of the first class, the original mile monuments, are composed for the greater part of red sandstone posts, dressed with eastern and western upper angles rounded and are generally fifteen inches wide in the direction of the boundary, seven inches thick and project above ground about twenty inches. The remainder are of rough, irregular shaped rock of different material, all having the name of the State cut on the appropriate side of the stone and also the number of the mile distant from the eastern terminus of the line.

The monuments of the second class, the new mile monuments, are of granite, four feet long, the tops dressed generally six inches by six inches in cross-section and for a distance down of six inches. Upon the north side are cut the letters "N. Y." and on the south side the letters "N. J." and upon the east side the number corresponding to the number of miles distant from the eastern terminus of the line. One-quarter-inch grooves are cut at right angles across the top parallel to the sides; one groove shows the direction of the boundary and the other is perpendicular to it. They project above ground about six inches. They are set east of and generally adjacent to the old mile stones.

The monuments of the third class, the Railroad monuments, are similar to the mile monuments, except that they are not marked with numbers.

The monuments of the fourth class, the Wagon Road monuments, are of granite and are four and one-half feet long; the tops are dressed six inches by twelve inches in cross-section and for a distance down of twelve inches. They are marked in the same manner as the Railroad monuments and project about twelve inches.

The monuments of the fifth class, the Terminal and Witness monuments, are as follows, viz.:

The monument at the eastern terminus is a large block of trap-rock, seven feet six inches long, three feet two inches high and about four feet thick. It is located at the foot of the Palisades and about six inches above storm tides of the Hudson river. It is marked with a groove upon its perpendicular eastern face for its full height, at a distance of two feet south from its northerly end, and is further marked with the words "Latitude 41° North"

and on the north side of the groove the words "New York" and on the south side thereof the words "New Jersey."

The monument at the western terminus of the line is of cut granite, two feet four inches long, one foot four inches wide, and projects now only one foot five inches above the surface of the rock in which it is embedded. It is marked upon its top surface with one-quarter-inch grooves, showing the direction of the lines of the three States which meet there, and within the surface bounded by the lines the initials of the respective States are cut. The north side of the stone is further marked with the words "Tri States Monument." Each of these Terminal monuments has a witness, or reference monument located in the most suitable place nearest to it.

The monuments were generally found to be in good condition. Some of them were more or less chipped at the corners and edges, but not to such an extent as to affect their usefulness as monuments or to warrant replacing them with new ones. Others were found to lean slightly from their true vertical position, but not to such an extent as to require resetting.

The following monuments should receive prompt attention. The Permanent monument and the Morgan Range beacon of the Raritan bay boundary should be repainted with at least two coats of suitable paint. Range monument number 53 of the Arthur Kill and Kill von Kull boundary should be reset and its present position relative to its original position fully and accurately noted. Range monuments numbers 4, 6, 13, 24, 37, 48, 49, 56 and 56-A of this boundary should be found or relocated and, when necessary, reset. Monuments numbers 17, 24, 64, 70, 78, 83, 95, 101 and 107 of the boundary extending from the Hudson river to the Delaware river should be reset; and monuments numbers 44 and 84 should be found or relocated and, if necessary, reset.

We have made an approximate estimate of the cost of the above work, which in the aggregate amounts to \$3,500.

During the progress of this examination we obtained much valuable information concerning the location of the different monuments from the people living near the line, and believing that one of the important guards for the protection and maintenance of these monuments is the knowledge as to their location, etc., pos-

sessed by those living near them, where the occasion required it, we made it a point to impart such information.

We found many discrepancies in the detailed descriptions of the monuments made in previous reports. These discrepancies were due to the changes in the ownership of land and the disappearance of trees and other reference or witness objects. In all these cases the changes are fully noted in the accompanying detailed description of the monuments, which is intended to form a part of this report.

Very respectfully,

O. F. LEWIS, CIVIL ENGINEER,

Representing the State of New York.

CHARLES HOPPER, CIVIL ENGINEER,

Representing the State of New Jersey.

September 3, 1912.

The field book, containing a complete description of each monument and its location, is on file in the office of the State Engineer and Surveyor.

MONUMENTS MARKING THE NEW YORK-NEW JERSEY BOUNDARY LINE.

MONUMENT.	Location.	Kind.	Condition.	Remarks.
ACROSS LANDS UNDER WATER IN RARITAN BAY.				
Romer lighthouse or beacon Permanent.....	Just off Sandy Hook.....	Lighthouse.....	Good.	
Morgan Range beacon.....	In Raritan bay.....	Steel tower embedded in riprap.....	Fair.....	Needs repainting.
	On the highland one mile south of South Amboy, N. J., on lands of Otis Sand Line Brick Co.....	Steel tower.....	Fair.....	Needs repainting.
Great Beds lighthouse.....	On Raritan bay.....	Lighthouse.....	Good.....	Cared for by U. S. government.
ACROSS LANDS UNDER WATER IN ARTHUR KILL AND KILL VON KULL.				
No. 1.....	Perth Amboy, N. J., rear of old blacksmith shop. On Front street, on lands of I. B. Isenberg.....	Granite.....	Fair.....	Cross needs to be reset.
No. 2.....	Tottenville, S. I., on lands of Jere Johnson.....	Granite.....	Good.	
No. 3.....	Tottenville, S. I., on lands of Frederick Baxter.....	Granite.....	Good.	
No. 4.....	Tottenville, S. I., on lands of Frederick Baxter.....	Granite.....	Good.	
No. 5.....	Tottenville, S. I., on lands of Adeline Dorcey.....	Granite.....	Good.	Missing; should be reset.
No. 6.....	Tottenville, S. I., on lands of Harry Corsey.....	Granite.....	Good.	Missing; should be reset.
No. 7.....	Tottenville, S. I., on lands of Mrs. Wilmer Shay.....	Granite.....	Good.	
No. 8.....	Tottenville, S. I., on lands of Atlantic Terra Cotta Co.....	Granite.....	Good.	
No. 9.....	‡ mile north of Kreischerville, S. I., opposite Sewarden hotel.....	Granite.....	Good.	
No. 10.....	Sewarden, N. J., on lands of C. A. Cuppia.....	Granite.....	Good.	
No. 11.....	Sewarden, N. J., on lands of P. A. Sollace.....	Granite.....	Good.	
No. 12.....	On southeast side of Cliff road, ‡ mile north of Sewarden.....	Granite.....	Good.	
No. 13.....	Port Reading, N. J., on lands of Port Reading R. R. Co.....	Granite.....	Good.	Missing; should be reset.
No. 14.....	‡ mile west of Borough of Roosevelt, N. J., on lands of Port Reading R. R. Co.....	Granite.....	Good.	
No. 15.....	‡ mile northwest from Rossville, S. I., on lands of Oakland Chemical Co.....	Granite.....	Good.	
No. 15-A.....	‡ mile northwest from Rossville, S. I., on lands of Oakland Chemical Co.....	8" x 8" granite, with copper plug.....	Good.	
No. 16.....	Rossville, S. I., on lands of Mrs. Hattie Lyon.....	Granite.....	Good.	
No. 17.....	Rossville, S. I., on lands of Miss Mary Cole.....	Granite.....	Good.	
No. 18.....	Rossville, S. I., on lands of Mrs. Harriett Clark.....	Granite.....	Good.	

No. 19.	le, S. I., on lands of	Granite.	Good.	
No. 20.	N. J., on lands of	Granite.	Good.	
No. 21.	N. J., on lands of	Granite.	Good.	
No. 22.	Canda Bros., on lands of	Granite.	Good.	
No. 23.	Borough of Roosevelt, N. J., on lands of	Granite.	Good.	
	American Agricultural Chemical Co.			
	(Liebig Works)			
No. 24.	Branch of Chemical Co.	Granite.	Good.	
No. 25.	J., on lands of			Missing; should be reset.
No. 26.	lands of American	Granite.	Good.	
No. 27.	J., on lands of	Granite.	Fair.	
No. 28.	Linoleumville, S. I., on lands of Peter	Granite.	Good.	
	Cannon			
No. 29.	Linoleumville, S. I., on lands of Peter	Granite.	Good.	
	Cannon			
No. 30.	Linoleumville, S. I., on lands of Mr. Meyer	Granite.	Good.	
	I., on lands of The	Granite.	Good.	
No. 31.	I., on lands of The	Granite.	Fair.	
No. 32.	I., on lands of The	Granite.	Fair.	
No. 33.	of J. B. Drake,	Granite.	Good.	
No. 34.	of Mrs. Scudder,	Granite.	Good.	
No. 35.	of Mrs. Scudder,	Granite.	Good.	
No. 36.	ur kill	Granite.	Good.	
No. 37.	Standard Oil Co	Granite.	Good.	
No. 38.	Standard Oil Co	Granite.	Good.	
No. 39.	of Wadark Wire	Granite.	Good.	
No. 40.	lands of Staten	Granite.	Good.	
No. 41.	lands of J. I. House-	Granite.	Good.	
No. 42.	lands of John J	Granite.	Good.	
No. 43.	lands of John J.	Granite.	Good.	
No. 44.	lands of John J.	Granite.	Good.	
No. 45.	Dooley	Granite.	Good.	

MONUMENTS MARKING THE NEW YORK-NEW JERSEY BOUNDARY LINE — (Continued).

MONUMENT.	Location.	Kind	Condition.	Remarks.
ACROSS LANDS UNDER WATER IN ARTHUR KILL AND KILL VON KULL — (Continued).				
No. 46	Port Richmond, S. I., on lands of John J. and Mary A. Worth, No. 2233 Richmond terrace	Granite	Good.	
No. 47	Port Richmond, S. I., on lands of Standard Oil Co.	Granite	Good.	
No. 48	Bergen Point, Bayonne, N. J., on lands of Cable Co.			Missing; should be reset
No. 49	Bergen Point, Bayonne, N. J., on lands of The Safety Insulated Wire & Cable Co.			Missing; should be reset
No. 50	Bergen Point, Bayonne, N. J., on lands of			
No. 51	lands of C. W. J., on lands of	Granite	Good.	
No. 52	Gulf Refining Co., on lands of Staten Island Rapid Transit Ry. Co.	Granite	Good.	
No. 53		Granite	Fair.	
		Granite	Fair.	Has been moved, should be reset and location in reference to original position noted.
No. 54	New Brighton, S. I., on lands of Sailor's Snug Harbor	Granite	Good.	
No. 55	New Brighton, S. I., in roadway of Richmond terrace, 165 ft. east of Westervelt avenue.	Granite	Good.	
No. 56	St. George, S. I., on lands of B & O R. Co. at west end of yard			
No. 56-A	St. George, S. I., opposite junction of Stuyvesant place and Jay street.	Brass bolt in cement walk.	Good.	Missing; should be reset.
ON LANDS FROM HUDSON RIVER TO DELAWARE RIVER.				
Eastern Terminal	Snedens monument.	Block of trap-rock.	Good.	
Eastern Witness	Alpine.	Granite.	Good.	
No. 1	Lot of hill boulevard.	Granite.	Good.	
No. 2	Indes, on	Original, brownstone; new, granite.	Good.	

No. 3.....	Granite	Good.
No. 4.....	Granite.....	Good.
No. 5.....	Original, brownstone; new, granite.....	Good.
No. 6.....	Granite.....	Good.
No. 7.....	Granite.....	Good.
No. 8.....	Granite.....	Fair.
No. 9.....	Granite	Fair.
No. 10	Granite.....	Good.
No. 11.	Original, brownstone; new, granite.....	Good.
No. 12.	Granite	Good.
No. 13	Granite	Good.
No. 14	Granite	Good.
No. 15	Original, brownstone; new, granite.	Good.
No. 16.. ..	Granite.	Good.
No. 17.. ..	Original, brownstone; new, granite.	Good.
No. 18....	Granite.....	Good
No. 19	Original, brownstone; new, granite	Good.
No. 20	Granite	Good.
No. 21... ..	Original, brownstone; new, granite.....	Good.
No. 22... ..	Granite.....	Good.
	Granite.....	Good.

Leans badly; should be reset.

MONUMENTS MARKING THE NEW YORK-NEW JERSEY BOUNDARY LINE — (Continued).

MONUMENT.	Location.	Kind.	Condition.	Remarks.
ON LANDS FROM HUDSON RIVER TO DELAWARE RIVER — (Continued).				
No. 23.	Two stones in open field, on lands of Mrs. Laura H. Hollis	Original, brownstone; new, granite....	Good.	
No. 24.	East side of road, about 400 ft west of monument No. 23	Granite	Fair	Leans badly; should be reset.
No. 25.	North side of road leading from Pearl River to Saddle River, about $\frac{1}{4}$ mile west of monument No. 23	Granite	Good.	
No. 26.	At junction of roads leading from Nannette to Saddle River and cross road to Pearl River	Granite	Good.	
No. 27.	On west side of road leading from Hackensack to Spring Valley and about 110 ft. east of monument No. 28	Granite	Good.	
No. 28.	Two stones in open field belonging to Mr. Post	Original, brownstone; new, granite	Good.	
No. 29.	On west side of road near J. H. Halley's house	Granite	Good.	
No. 30.	Two stones in open field belonging to J. H. Halley	Original, brownstone, new, granite	Good.	
No. 31.	On east side of road leading from Saddle River, near Michael Connelley's barn	Granite	Good.	
No. 32.	Two stones in open lot belonging to M. T. Connelley	Original, brownstone; new, granite	Good.	
No. 33.	North side of road, near Morris Solperstein's house	Granite	Good.	
No. 34.	East side of road at foot of hill adjoining lands of Margaret DeBarry	Granite	Good.	
No. 35.	On west side of River Valley road, about $\frac{1}{2}$ mile west of monument No. 32	Granite	Good.	
No. 36.	Two stones in wood lot of Cornelius Snyder	Original, brownstone; new, granite	Good.	
No. 37.	On east side of road leading from Saddle River in top of hill, near box	Granite	Good.	
No. 38.	Two stones on west slope of hill in open field of L. H. Doremus	Original, brownstone; new, granite	Good.	
No. 39.	On east side of road, near house of L. H. Doremus	Granite	Good.	
No. 40.	On west side of road at foot of hill, near Dr. Hill's house	Granite	Good.	
No. 41.	Two stones near edge of woods and $\frac{1}{4}$ mile west of W. H. Way's house	Original, brownstone; new, granite	Good.	

No. 42.....	Granite.....	Good.
No. 43.....	Granite.....	Good.
No. 44.....	.....	.....
No. 44-A.....	Granite	Good.
No. 45.....	Original, brownstone; new, granite.	Good.
No. 46.....	Granite.....	Good.
No. 47.....	Granite.....	Good.
No. 48.....	Original, brownstone; new, granite.....	Good.
No. 49.....	Original, brownstone; new, granite	Good.
No. 50.....	Granite.....	Good.
No. 51.....	Original, trap-rock; new, granite.....	Good.
No. 52.....	Granite	Good.
No. 53.....	Granite	Good.
No. 54.....	Original, sandstone; new, granite.....	Good.
No. 55.....	Granite.....	Good.
No. 56.....	Original, granite; new, granite.....	Good.
No. 57.....	Granite	Fair.
No. 58.....	Original, granite; new, granite.....	Good.
No. 59.....	Granite.....	Good.
No. 60.....	Original, irregular slab; new, granite.....	Good.
No. 61.....	Original, slab slate; new, granite.....	Good.
No. 62.....	Original, sandstone; new, granite.....	Good.

Missing; should be reset.

MONUMENTS MARKING THE NEW YORK-NEW JERSEY BOUNDARY LINE—(Continued).

MONUMENT.	Location.	Kind.	Condition.	Remarks.
ON LANDS FROM HUDSON RIVER TO DELAWARE RIVER—(Continued).				
No. 63	On west side of N. Y. & Greenwood Lake R. R. track, about 100 ft. from Greenwood railroad station.	Granite	Fair.	
No. 64	At east foot of Rough mountain near Hobokus club house	Granite	Fair.	Leans badly; should be reset.
No. 65	On west side of road and about 150 ft. west of monument No. 64	Granite	Good.	
No. 66	On top of Rough mountain, on west edge of bad swamp	Granite	Good.	
No. 67	Half-way up easterly slope of steep hill in woods	Original, alab; new, granite	Good.	
No. 68	On west side of road, about $\frac{1}{4}$ mile west of	Granite	Fair.	
No. 69 . . . .	. . . ., in open	Original, sandstone; new, granite	Fair.	
No. 70 . . . .	. . . . ft. from	Granite	Fair.	Leans badly; should be reset.
No. 71 . . . .	. . . . d 100 ft.	Original, fieldstone; new, granite	Good.	
No. 72	On east side of road, just east of where brook	Granite	Good.	
No. 73 . . . .	. . . . m house	Granite	Good.	
No. 74	Carey.	Granite	Good.	
No. 75	south of	Granite	Good.	
No. 76	south of	Granite	Fair.	
No. 77 . . . .	. . . . to L.	Original, brownstone; new, granite	Good.	
No. 78	On north side of Lehigh and Hudson River R. R. track, about 17 ft. east of cattle-pass	Granite	Fair.	Leans badly; should be reset.
No. 79	On south side of road, about $\frac{1}{4}$ mile west of monument No. 77	Granite	Fair.	
No. 80	On west side of road at east foot of hill, about 600 feet west of monument No. 79	Granite	Good.	
No. 81	Two stones on east slope of ridge, near line fence on property of A. Ely	Original, brownstone; new, granite	Good.	
No. 82	On west side of road, about $\frac{1}{4}$ mile west of monument No. 81	Granite	Good.	

No. 83.....	Original, -----; new, granite.....	Fair.....	Leans badly; should be reset.
No. 84.....	.....	.....	Both stones lying beside brook.
No. 85.....	.....	.....
No. 86.....	Granite.....	Good.	
No. 87.....	Granite.....	Good.	
No. 88.....	Original, brownstone; new, granite.....	Good.	
No. 89.....	Granite.....	Good.	
No. 90.....	Granite.....	Good.	
No. 91.....	Granite.....	Fair.	
No. 92.....	Granite.....	Good.	
No. 93.....	Granite.....	Good.	
No. 94.....	Original, slate slab; new, granite.....	Good.	
No. 95.....	Granite.....	Good.	
No. 96.....	Granite.....	Poor	Leans badly; should be reset.
No. 97.....	Granite.....	Fair.....	Leans badly; should be reset.
No. 98.....	Granite.....	Good.	
No. 99.....	Granite.....	Good.	
No. 100.....	Granite.....	Fair.	
No. 101.....	Granite.....	Good.	
No. 102.....	Granite.....	Fair.....	Leans badly; should be reset.
No. 103.....	Original, slate slab; new, granite.....	Good.	
No. 104.....	Granite.....	Fair.	
	Original, slab; new, granite.....	Good.	

BLACK RIVER SURVEY.

OFFICE OF BLACK RIVER SURVEY,
45 SAVINGS BANK BUILDING,
WATERTOWN, N. Y.

April 12, 1912.

MR. EDWIN STYRING, *Division Engineer, Syracuse, N. Y.:*

Dear Sir:— Having finished the work specified in chapter 190 of the Laws of 1911, which is an act concerning the extension of the Black River canal from Carthage to Sacketts Harbor, known as the Black River Survey, I am attaching hereto my report on the same.

Yours respectfully,

LOUIS A. BURNS,
Resident Engineer.

AUTHORIZATION OF SURVEY.

Chapter 190 of the Laws of 1911 provides as follows:

AN ACT to provide for surveys, estimates and plans for improving certain portions of the Black River in Jefferson county, and making an appropriation therefor.

Became a law May 24, 1911, with the approval of the Governor. Passed, three-fifths being present.

The People of the State of New York, represented in Senate and Assembly, do enact as follows:

Section 1. The sum of fifteen thousand dollars (\$15,000), or so much thereof as may be necessary, is hereby appropriated out of any moneys in the state treasury, not otherwise appropriated, for the state engineer and surveyor, for the making of a survey and the preparation of plans and estimates for improving the Black river for navigation between the state dam at Carthage, Jefferson county, and Sacketts Harbor, on Lake Ontario; the moneys hereby appropriated to be paid out by the state treasurer, upon the warrant of the comptroller, to the order of the state engineer and surveyor.

§ 2. This act shall take effect immediately.

The necessary appropriation was thus made available.

REPORT.

Division Engineer: Styring assigned me to this work. Accordingly, on July 24 and 25, 1911, in company with First Resident Engineer Moulton and Mr. C. C. Burns, chairman of the Canal Board of the Watertown Chamber of Commerce, a reconnaissance of the possible routes was made. The feasible routes were separated from the others and definite ideas of each were obtained. On conferring with Division Engineer Styring concerning the most suitable field method, it was decided to use stadia measurement throughout.

On July 31, 1911, survey work was begun at Sacketts Harbor. All base lines were run easterly towards Carthage. This out-of-door work was finished December 23, 1911, and to cover all routes required 175 miles of stadia base line. Office work was then commenced. On April 10, 1912, the maps, profiles, diagrams and estimate were completed. To completely investigate the project, required the estimating of 114.89 miles of line. On this date, the office at Watertown was closed and its contents shipped to the Division Engineer's office in Syracuse. Although there are several thousand dollars left of the \$15,000 appropriation, it is doubtful if this amount would have been sufficient, had not the most rapid survey methods been adopted. From the maps, etc., that are being filed a smaller-sized prism and locks may be computed at any time before the appropriation reverts to the State treasury. The estimate accompanying this report is for 12 feet of depth in prism and over miter sills. This "full-sized Barge canal" depth is the desire of all interested in the project. If the cost of the proposed canal proves to be too great, it should be remembered that the locks represent a large amount and these must be reduced in size if the total is to be cut down.

The attached folder map is designed to give the general understanding of the project which is needed to make clear the various sections of the report. A "History of Former Projects" is offered so as to make known the fact that the idea of a canal from

Carthage to Lake Ontario is far from a new one. The portion under the heading "Description of Routes" is supposed to be used in connection with the folder map. In the section "Discussion of Routes" there are put forth the reasons for recommending certain routes. Under the caption "Investigation of Water-Supply" much attention has been given to explaining the sources of supply outside of the Black river watershed. The reason for this is that the flooding of State land for storage purposes is prohibited by law. Although the adequate, inexpensive storage reservoirs of the Adirondack region have been considered under present condition, there seems to be little hope of their being available.

The attached cost diagrams will be of great assistance in the comparison of routes and the folder map should be referred to, while examining these diagrams.

The report is divided into the following parts:

History of Former Projects.

Methods.

Description of Routes.

Discussion of Routes.

Investigation of Water-Supply.

Information Already Submitted for Legislative Purposes.

Estimates.

HISTORY OF FORMER PROJECTS.

For over one hundred years the Black river valley has been the scene of great commercial activity. The desire of utilizing its wonderful natural advantages was shown in the year of 1810, by the determination to link the vast navigable waters of Lake Ontario with the powerful flow of the Black river. In the history of Jefferson county are related the following pertinent facts:

In the early days of Brownville, much importance was attached to the navigation of the Black river between Lake Ontario and this village. Accordingly, in 1810, the Black River Navigation Company was incorporated and the necessary locks at Dexter were built, first of wood and later, in 1828, of stone, to accommodate a steamer named "Brownville," which was built to navigate as far

as Ogdensburg and return. It had a keel of 80 feet, a beam of 20 feet and a depth of hold of $6\frac{1}{2}$ feet, with a burden of 100 tons and engines of 35 to 40-horse-power. She was built in the village of Brownville on the north side, and having with difficulty passed the locks, was burned to the water's edge on her first trip to Ogdensburg. After having served for about 20 years, these locks were abandoned, to give way to the erection of hydraulic structures for power purposes. The village of Dexter has long since been considered the head of navigation on the Black river.

In 1832 a hydraulic canal twenty feet wide at the top, twelve feet wide at the bottom and four feet deep was finished from Huntington's Mills on Black river, two miles above the village of Watertown, to the village of Sacketts Harbor on Lake Ontario, which port was then the industrial center of Jefferson county. Elisha Camp assumed, under certain conditions, the stock necessary for the project, and for this reason the canal was popularly known as Camp's Ditch. The law under which the canal was operated was so framed that it gave rise to much litigation. The greatest difficulty encountered, however, was in maintaining the first half-mile of the canal, which was constructed along the margin of Black river where it was liable to be washed away on one side and filled with slides of clay on the other. These difficulties finally led to the abandonment of the canal, after it had been in use for about ten years.

In 1838 sundry petitions from the inhabitants of Jefferson and other contiguous counties interested the legislators in the extension of the Black River canal from Carthage to Sacketts Harbor on Lake Ontario. It was stated that the traffic of the canal would be increased more than two hundred per cent by this extension; that the county of Jefferson was one of the most productive in manufactures and in agriculture of any in the state; that there were numerous manufactories of cottons and woolens, forges, furnaces, nails, glass and machinery; that the product of the dairies was large and that, as a grazing and wheat-growing country, it was surpassed by but few in the state. In addition, it was argued that, by the construction of this short line in the chain of communications, more than six hundred miles of canal and inland boat-navigation would thereby become connected with the canals of this

state, forming a continuous navigation from the lakes and rivers and canals of the northern border to the great seaport, New York.

The question was not acted upon at that session and, therefore, petitions of similar import were forwarded to the Legislature in 1839, when an act (chapter 321) provided for a survey of a canal route to continue the Black River canal from Carthage to Lake Ontario in the county of Jefferson. The result of the survey was to be reported to the Legislature in 1840, together with the estimated cost of the extension, the probable amount of revenues to be received and an estimate showing to what extent the revenue of the Black River canal would be increased in the event of the extension being constructed.

Edward H. Broadhead, a civil engineer, was appointed to make the survey, two other engineers being assigned to assist him in the work. The surveys and estimates were made for a canal of the following dimensions: The depth of water was to be four feet, width of bottom, twenty-six feet, width at water-surface, forty-two feet; the banks were to be three feet above the water-line, with a slope of two feet horizontal base to one foot rise, both in front and rear, while the width of the towing path was to be twelve feet and of berme, seven feet. Several routes were surveyed, the names of the routes, their length, the number of locks, the amount of lockage and estimate of cost being as follows:

Carthage to Sacketts Harbor: Length, $31\frac{1}{4}$ miles; 50 locks; 480 feet of lockage; total cost with stone locks, \$1,444,614.28; with composite locks, \$1,230,629.28; with wooden locks, \$1,040,027.28.

Carthage to Dexter: Length, $27\frac{3}{4}$ miles; 50 locks; 480 feet lockage; total cost with stone locks, \$1,394,036.32; with composite locks, \$1,180,176.02; with wooden locks, \$988,943.02.

The canal commissioners who transmitted the report of the surveys were unable to adequately estimate the amount of revenue to be derived, if the extensions were made, and the Assembly passed a resolution directing them to do so at the next Legislature. The commissioners reported at the time designated and stated that any estimate would necessarily be conjectural, that they did not feel authorized to submit any estimate which might be taken as a basis for legislation, and referred the legislators to the report of Mr.

Broadhead for the estimated cost. A large number of petitions appeared before the Legislatures of the next few years. Finally provision was made for the selection of one of the routes surveyed, by three disinterested men from the first, second and third, or eighth, senatorial districts, but a change of policy in relation to the minor public works, which also suspended the larger, put an end to the discussion by postponing it indefinitely.

METHODS.

Surveys.

All measurements were taken by stadia. Where possible the base lines were run so as to form closed traverses. Azimuths were frequently checked by observations on the star, Polaris. Accurate wye levels were used to establish frequent bench marks, to check stadia work. These levels were circuits from existing U. S. G. S. bench marks, and sea level datum from this source was used throughout the surveys. Coördinates were computed with a zero assumed in such a position as to enable all lines to be approximately checked by the U. S. G. S. sheets.

Maps.

Topographic maps were plotted, 100 feet to 1 inch, from the stadia surveys. Maps of 1,000 feet to 1 inch were pantographed from these, and the outlines of the former shown. The U. S. G. S. topographic sheets were mounted on cloth and used as index maps for the various lines and routes.

Existing maps were used where reliable ones could be obtained. The City Engineer of Watertown furnished a contour map which was of great assistance in estimating the North Watertown route. The U. S. Deep Waterway maps were used in estimating the North Branch reservoir and the Rutland Hollow route. The Deer River Power Company's topographic maps of portions of the Deer river were of assistance. The original sheets of the Black River bay "harbor survey" were photographed by the Lake Survey Office in Detroit and prints sent to this office upon showing them the great saving such information would be to this appropriation. Maps, sections and various other information concerning the Black river between Huntingtonville and Dexter were loaned by Mr. Frank A. Hinds, civil engineer, and proved to be of great use in estimating the City River and Dexter routes.

Computations.

The 100 feet to 1 inch topographic sheets were matched together on a very large floor and the center line of canal projected upon them. The necessary cross-sections were then picked off and plotted. By means of a thread and a prism template, the depth of the level cutting was determined. The sectional area was then taken from a table computed for the purpose. This saved a vast amount of time planimetering sections and by trial proved to be close enough for preliminary estimate purposes. In computing embankment, the heights were determined from the topographic sheets and corresponding areas taken from a suitable table. To simplify computation, rock was assumed to stop with a full rock section at a certain station and a full section of earth to begin at this same point. By study of field conditions, the change from rock to earth was made half-way between the full rock section and the full earth section.

Cost of Locks.

The contract prices of a number of locks were obtained. These structures are either finished or are now being built on the Barge canal. The lifts vary from 10 to 40 feet. A sufficient amount of data was obtained to enable a curve to be plotted. The costs of the locks of the required lifts on this work were then picked off. The costs of locks of the same lifts, but being 188 feet long by 28 feet wide were also estimated. The 1901 report on the Barge canal was of assistance here. The 328 feet by 28 feet locks, estimated in that report, were modified by cutting out 140 feet of the body of the lock and changing the unit price of concrete from \$6.00 per cubic yard to \$6.50, to fit present conditions. From this information, a curve was plotted. This curve was checked by modifying the costs of the Barge canal present size locks (328 feet by 45 feet) in a somewhat similar manner, thus arriving at the costs from a different source.

Costs of Bridges.

The costs of the bridges shown in the tables of the 1901 report were examined. Those of span and kind suitable to this canal were picked out, preference being given to the data concerning

such bridges as were known to have conditions similar to those on this work. The data thus compiled were checked by information obtained from William R. Davis, chief bridge designer on Barge canal construction.

Costs of Dams.

The heights of the various dams were determined. The sections and quantities were then computed. Where flood gates were considered necessary, the Tainter type was estimated. Data on the cost of such gates were obtained from those installed in the Phoenix dam. At Phoenix, flood flow and conditions are very similar to those on the Black river.

Unit Prices.

Rock excavation (Trenton limestone, dry).....	\$1 50
Rock excavation (Trenton limestone, subaqueous, but may be unwatered).....	2 50
Rock excavation (Trenton limestone, subaqueous with no probability of unwatering).....	3 00
Earth excavation (soft silt, can be dredged).....	0 20
Earth excavation (stiff, can be steam shoveled).....	0 35
Concrete (in locks, dams, bridges, abutments, etc.)....	6 50

Stream Gaging.

A weir was built on the North branch of Sandy creek at West Rodman. This hamlet is two miles from the village of Adams Center, which is on the New York Central railroad. The weir was built with a 30-foot crest and a 3-foot depth of notch. It is worthy of note, that the flow of this stream was sufficient to cause this weir to discharge under a head of 3 feet during part of the month of March, 1912.

On the East branch of Sandy creek a mill dam in the village of Rodman was equipped with a gage. The mill owner is the gage-reader and takes the heights of water flowing over the crest each morning before starting his wheels. This does away with computing the volumes of discharge with old, uncalibrated wheels entering into the problem. This village is about four miles from the railroad station at Adams Center.

On the Deer river a gaging station was established near the village of Copenhagen, which place is on the Carthage and Copenhagen railroad. The new concrete dam at High falls is used as a weir and the discharges of the modern wheels connected to the penstock leading from this dam are taken into account.

At all three places the gages will be read until at least one year's data are complete. Rainfall records, at three near-by, characteristic places, will be taken as usual by the Federal observers, and such readings are at all times available for use in our computations, through the courtesy of the men at these stations.

DESCRIPTION OF ROUTES.

The result of estimating 44 lines was 10 combinations, which will be called routes. For convenience, these will be grouped under three divisions as follows:

Division No. 1.—From Carthage to Watertown.

Division No. 2.—In and around Watertown.

Division No. 3.—From Watertown to Sacketts Harbor.

The Black River and Rutland Hollow routes extend from Carthage to Watertown.

The Beaver Meadow, City River, North Watertown, and Sandford Corners routes are the ones in and around the city of Watertown.

The Camp's Ditch, Muskalonge Creek, Basin and Dexter routes extend from Watertown to Sacketts Harbor.

Each route will now be briefly described, with aid of the attached index map.

DIVISION NO. 1 (ROUTES FROM CARTHAGE TO WATERTOWN).

Black River Route.

(Line numbers: 29, 26, 24, 23, 21, 35, 20 and 19 of index map.)

This route begins at the county line, which is about three-quarters of a mile up stream from the State dam in the village of Carthage. Thence it extends down the river. The State dam and the rapids below it are passed by means of two locks and a dam. This dam, like the others to be mentioned later, will be provided with suitable gates to prevent flooding, and also in navigation season, to maintain the desired pool level. The long pond now

formed by the Herring dam will be utilized and by means of a lock, with the necessary channel excavation below it, the still-water is reached, which is caused by the St. Regis Paper Company's dam. Just above this dam the route leaves the river and follows the head-race of the company. On arriving at the mill, two locks are built, which bring the line again into the river. From this point to the village of Great Bend the river is followed. A short cut-off with a lock at its lower end brings the route around the dam in this village. When the Lefevre dam is reached, a lock is built at its northerly end; and another is necessary on arriving at Felts Mills. Before the village of Black River is reached, a lock and dam are necessary, and just above the village the route again leaves the river. Here it crosses the point and passes near the railroad station. At the lower end of this cut-off, two locks are required to again enter the river channel. A lock and dam must be built near Town Eddy, which is the head of the Huntingtonville level. As now existing, this level extends from this point to the eastern limits of the city of Watertown.

Rutland Hollow Route.

(Line numbers: 40, 39 and 37 of index map.)

This route leaves the still-water formed by the State dam in the village of Carthage, near the southerly end of this structure. The level of this still-water, as the route extends down stream in approximately the same direction as the river, is maintained and only after eleven and one-half miles are passed is a lock necessary. Thence the route continues westerly to and into what is known as the Rutland hollow; thence down this hollow, the slope of the bottom being taken care of by one lock. A descent of the falls at the lower end of the hollow requires a flight of five locks. At the foot of this flight the line turns northward and by the use of one more lock passes into the Huntingtonville level.

DIVISION NO. 2 (ROUTES IN AND AROUND WATERTOWN).

Beaver Meadow Route.

(Line numbers: 34, 18, 33, 32, 15 and 14 of index map.)

This route leaves Black river from the Huntingtonville level and extends in a southwesterly direction through the southern

portion of the city of Watertown, to what is known as the Beaver meadow. In order that the levels may be economically fed, the Huntingtonville level is carried to the vicinity of Franklin street, before the first lock is built. Two more locks are necessary to bring the route to Beaver meadow. After passing which place, the route bears northerly and by means of a flight of two locks at the falls near Massey street it joins Camp's Ditch route about a mile from the city's westerly limits.

Sandford Corners Route.

(Line numbers: 12, 10 and 9 of index map.)

This route leaves the Huntingtonville level and bears northward. A flight of two locks near Cary's limekiln carries the route down into the valley of Cowans creek; thence down this valley by means of four locks and into Black river again at the pool to be formed by a dam near the fair grounds.

City River Route.

(Line number: 42 of index map.)

This route follows the river from Huntingtonville level by placing a lock at the southerly end of the existing dam. This lock, with the necessary channel excavation below it, brings the route into the pond formed by the dam at the city pumping station. To leave this still-water a lock and suitable dam are necessary at the pumping station. Thence the route continues down the river, passing in turn the dams known as Marble Works, Sewell's island, and Farwell and Rhines, by locks and suitable dams, until the pool above Beebe's island is reached. Here the river is left and a new channel is dug on the north side, following what is known as Front street. The river is entered again by means of a lock at the foot of this street. Thence the route proceeds down the river, locking through the Taggart dam into pool to be formed by a dam near the fair grounds.

North Watertown Route.

(Line numbers: 11 and 9 of index map.)

This route leaves the Huntingtonville level from the channel on the north side of Huntington island. Thence it extends in a

westerly direction through the northern portion of the city of Watertown. The first lock is necessary near Pearl street and the route descends into the valley of Cowans creek by means of four locks. The route extends down this valley and another lock near Main street brings it into the pool to be formed near the fair grounds.

DIVISION NO. 3. (ROUTES FROM WATERTOWN TO SACKETTS HARBOR.)

Camp's Ditch Route.

(Line numbers: 4, 2 and 1 of index map.)

This route leaves the pool to be formed near the fair grounds in Watertown and extends southerly through the westerly portion of the city; thence westerly along the broad, swampy valley that leads to Mill creek; thence down the valley of this creek until Black River bay is reached; thence through this bay to Sacketts Harbor on Lake Ontario.

Muskalonge Creek Route.

(Line numbers: 36, 8, 6 and 5 of index map.)

This route leaves the pool to be formed near the fair grounds in Watertown and extends down Black river until what is known as Mill Number 4 is reached. The dam at this point must be raised. This higher pool level is carried along the side hill on the southerly margin of what was formerly known as Glen Park, until near Coffeen Street road, where a lock is necessary. Thence the route extends to the valley of Muskalonge creek and down same, with the necessary locks to take care of the fall, until Muskalonge bay is reached; thence in a dredged channel across this bay to Storrs point, where deep water in Black River bay is reached; thence through Black River bay to Sacketts Harbor on Lake Ontario.

Dexter Route.

(Line numbers: 36, 41 and 44 of index map.)

This route leaves the pool to be formed near the fair grounds and extends down Black river. The still-water at present existing above the Number Four dam will be raised by a new structure

with suitable gates. A lock is required here and with the necessary channel excavation below it the pond above the Glen Park dam is reached. This dam must be replaced by a suitable one with proper height of crest and gates. The lock at this point must be placed at the southerly side of the river and several hundred feet downstream. This necessitates building an aqueduct to carry the canal until the lock can step it to the next lower level. The necessary enlarging and deepening of the channel below this point brings the route to the pond formed by the Ontario Mill dam. At this dam much expensive construction is necessary. A new dam with suitable gates is required and the pool level would have to be carried downstream several hundred feet. Also a rocky point would have to be cut through and the present channel otherwise modified. At the lower end of this cut the lock will bring the route into the pond formed by the Brownville dam. Having arrived at this dam, another difficult place is met with. The present dam would have to be replaced and provided with suitable gates. The canal can pass around the dam by a cut-off following the natural gully in the northern bank and lock down at its lower end, so as to avoid building an expensive aqueduct below the dam site. Thence the route proceeds down the gorge, which must be divided in a number of places. Thence through the basin it extends to the dam at Dexter. Here a lock is required and with the necessary channel excavation or extension of the upper pool the route passes downstream into Black River bay. The deposit of silt here encountered may be passed by placing a line of stone-filled cribs on either side of the desired channel location. The soft material having been dredged out, the cribs in conjunction with the accelerated current will probably be sufficient to maintain the channel. Thence the route continues through Black River bay to Sacketts Harbor on Lake Ontario.

Basin Route.

(Line number: 43 of index map.)

This is a link between the Muskalonge Creek and Dexter routes, which makes it possible to avoid canalizing the Black river between Mill Number four and the foot of Brownville gorge. To accomplish this, the Muskalonge Creek route is left near Brownville.

Thence the Basin route bears northerly and by means of three locks it enters Black river in what is known as the basin. Thence it follows the Dexter route to Sacketts Harbor.

DISCUSSION OF ROUTES.

The routes from Carthage to Watertown consist of the one following the Black river channel as near as practicable and another crossing the country to and down Rutland hollow.

By referring to the *Black River route*, as described and also as shown on the index map, one can see that it serves the shippers at the numerous paper mills and villages which lay along this stream; also that the canal follows a natural channel, thereby reducing to a minimum the amount of water to be supplied for navigation. Although costing more than the Rutland Hollow route (with so much of its lockage at one point and absence of dams), the Black River route is without doubt the best one to follow from Carthage to Watertown.

The North Watertown route is the best one in or around the city of Watertown on account of the following facts:

The Beaver Meadow route is long and costly and does not reach the majority of shippers.

The same is true of the Sandford Corners route.

The City River route, while passing very near a large number of shippers, is very costly and beset with difficulties, which render its construction and operation problematic.

The North Watertown route is the cheapest and is nearer the shippers than any other except the impracticable City River route.

The Muskalonge Creek route is the most feasible route from Watertown to Sacketts Harbor on account of the following facts:

The Camp's Ditch route costs more, is longer and does not serve shippers between Watertown and Lake Ontario.

The Dexter route costs more and is beset with precarious construction between Watertown and the foot of the Brownville gorge. Also the maintenance of a 12-foot channel through more than a mile of deep alluvial deposit at the river's mouth is doubtful. It may be done by the use of a dredge between the spring flood and the opening of navigation, but this entails continued expense and

the risk of delaying the annual opening of the canal. However, if this route were feasible, the shippers of the village of Dexter would have ideal service.

The Basin route, while doing away with the construction difficulties due to the character of the river between Number Four Mill and the foot of the Brownville gorge, costs more than the Muskalonge Creek route and still has the problem of maintaining a channel through the deposit at the river's mouth.

On the other hand, the Muskalonge Creek route passes within a short distance of the Number Four and Glen Park paper mills, also within a half-mile of the Ontario paper mill and those in the village of Brownville. It passes within two miles of the village of Dexter, where three paper mills are in operation. However, this village can now be entered by boats of about 4 feet draft. When properly constructed and operated these boats can bring cargoes very cheaply from the harbor in Muskalonge bay to the dock at Dexter. The rock in the bottom of Muskalonge bay is from 15 to 20 feet below the water surface, which will permit of cribs being built, or rock spoil, from farther up the canal, being deposited, to maintain the dredged channel and basis. No silt can then enter from the Black river flood waters and the amount brought down by the Muskalonge creek is very small. The channel as it approaches Storrs point is planned to be 500 feet wide, so as to give a sheltered harbor.

INVESTIGATION OF WATER-SUPPLY.

After careful consideration of the fairly extensive data that have recently been collected, the cargo capacity for one navigation season has been assumed to be two million tons.

Using locks of standard Barge canal size, the amount of water required for one season's operation is one billion cubic feet for lockage, and two hundred and fifty million for sustaining the levels. The use of smaller locks, of such a size for instance as to accommodate a single 1,000-ton barge, would reduce this volume by about one-half.

In arriving at the quantity of water necessary, the following assumptions were made: That standard Barge canal size locks will be used; that the Black river will be canalized between

Carthage and Watertown; that the traffic, as well as losses by percolation, will be lighter between these two places than between Watertown and Lake Ontario, and that water added at Carthage, to compensate the power owners for simply the loss due to lockage, is not available for diversion at Watertown to assist in operating the land channel. Accordingly, one and one-quarter billion cubic feet must be supplied near Watertown and one-half billion above Carthage, to operate the locks and sustain the levels during each navigation season.

In time of flood the Black river has been known to discharge as high as 23,000 cubic feet per second, but in time of drouth it has dwindled as low as one per cent of this amount. If the average yearly flow, as shown by daily measurements during the past fourteen years, was distributed uniformly, a flow of 3,600 second-feet at all times would be available. The capacity of storage reservoirs necessary to produce this ideal condition is shown by an accompanying hydrograph. The behavior of the Black river, as shown by the curve labeled "Natural Flow," is typical in every respect. Low water, particularly during the summer months, is a never failing source of embarrassment to any consumer of power who would dare depend upon water wheels for the constant operation of a plant. Consequently, under present conditions, no part of the river's flow can be diverted for canal purposes during the navigation season. This state of affairs can be changed to a large extent, because the upper portion of the drainage basin of the Black river is wonderfully adapted for cheap storage reservoirs of large capacity.

Between Carthage and Forestport, a distance of about forty-five miles, the Black river receives its principal tributaries. The streams that come from the east have their sources among the lake-studded areas of the Adirondacks. Taking a few of these tributaries in the order that one would encounter them if he journeyed upstream from Carthage, a brief description of some of their storage possibilities will now be given.

The first stream met with is not of Adirondack origin and enters the Black river on the west side. It is called Deer river. An area above Copenhagen of 85 square miles in extent is drained by this river. The part of the watershed that is adaptable to

storage is just above this village. At this point, seven-tenths of a billion cubic feet can be impounded by flooding about 700 acres of farm land. The cost of the reservoir would be approximately \$225,000, or about \$320 per million cubic feet of storage.

The next is the Beaver river. This is one of the largest tributaries. It rises in western Hamilton county. After crossing Herkimer county, it emerges from the Adirondack park at Number Four on the Lewis county line. At Beaver Flow reservoir, by raising the present dam about 12 feet, an additional storage of 3.4 billion cubic feet could be secured. This would simply be an enlargement of the present State reservoir. In making this improvement about 2,800 acres of additional State land would be involved. Most of this land is swampy and is now flooded every spring in the high-water period. The stream regulation which would result from the 3.4 billion storage would add 245 second-feet to the present minimum flow of the Black river.

Beaver lake is another reservoir site where approximately half a billion cubic feet could be impounded by a dam 8 feet high and 300 feet long. An additional area of about 600 acres would be flooded. About 25 acres of this is State land and all of the flooded area is barren.

At Crogan there is another storage site. By building a short dam 10 feet in height just above the village, about one-tenth of a billion cubic feet can be stored. All of the area that would be flooded is farm land.

In passing, notice should be taken of the Black river's smaller tributaries before we go on to the Moose river. The Independence river in its upper portion, likewise Otter and Fish creeks with their attached lakes, as well as Sugar river, all have storage capabilities. These streams are at present practically free from power developments. Consequently storage projects could be executed without these impediments.

The Moose river is one of the largest tributaries and it has a drainage area of 416 square miles. On this stream, between Fulton Chain and Minnehaha station, there is a storage reservoir site. If a dam 10 feet high and about 500 feet long was built near the latter place, a body of water about one and a half square miles in area would be formed. This would contain

about three-tenths of a billion cubic feet and would be entirely upon nearly valueless private land.

Another suitable place for storage on the north branch of the Moose river is about two miles below Minnehaha station, where there is now a dam about 800 feet long a short ways downstream from Nelson lake. This dam could be replaced by a new one and if the crest was 12 feet higher, the present lake would be raised this amount and another formed. Here a storage of about two-tenths of a billion cubic feet could be obtained. No State land would be flooded by this improvement.

On the south branch of the Moose river, at a place known as The Plains, if a dam 90 feet high was erected, with a low dike at its south end, a reservoir covering 4,600 acres with a capacity of about 6 billion cubic feet would be the result. A large part of the reservoir site, however, is State land, of which 2,600 acres is swampy and waste.

Returning to the Black river at Hawkinsville, below Forestport, another storage possibility is seen. By the erection of a dam of about 110 feet in height, 3.3 billion cubic feet of water would be impounded. This reservoir would lie outside of the Adirondack park, but a parcel of about 33 acres of State land would be included within its limits. The regulated flow which this reservoir would produce would be 207 second-feet, exclusive of the 250 second-feet which must pass through the Forestport feeder for use in the present Black River and Erie canals. The following tabulation shows concisely the condition:

Name of place.	Name of river.	Storage in billions of cubic feet.	Number of acres of State land flooded.
Copenhagen.....	Deer.....	0.7	None.
Beaver Flow.....	Beaver.....	3.4	2,800
Number Four.....	Beaver.....	0.5	25
Crogan.....	Beaver.....	0.1	None.
Minnehaha.....	Moose.....	0.3	None.
Nelson lake.....	Moose.....	0.2	None.
The Plains.....	Moose.....	6.0	4,600
Hawkinsville.....	Black.....	3.3	33

From the information available, it appears that to store water on the Black river watershed, in other than reservoirs of less than one billion cubic feet capacity, the flooding of State lands is necessary. Accordingly, attention is now called to the possibility of storage reservoirs on adjacent watersheds sufficiently close to avoid expensive feeders.

The only contiguous watershed that will assist in supplying water to the proposed canal is that of Sandy creek. Above the hamlet known as West Rodman, this stream has a drainage area of 100 square miles. The branches spread at this point. The one passing through Burrs Mills is called the North branch and the other portion flowing through Rodman is known as the East branch. These have, respectively, 38 and 62 square miles of drainage areas.

The larger area is unfortunately possessed by the torrential stream which offers but two storage sites of small capacity. On the other hand, the North branch is wonderfully adapted for a large reservoir.

From West Rodman the valley of this stream extends in a northeasterly direction towards Watertown. The valley has a remarkably level bottom and, while of goodly depth and width, it narrows up in several places. Computations for different locations, heights and kinds of dams that might be suitable and economical, appear on the sheets of the estimate. Apparently the most feasible location for a dam is just below the Whitford Corners-Rodman road. The cost of the reservoir with an earth dam at this point would be \$198,000. The capacity would be 1.6 billion cubic feet. This is \$124 per million cubic feet. The crest of this dam would be high enough to easily pass water into the Black river watershed at Sawyer's Corners. From this point a short feeder will carry the water to Cold creek at a cost of \$150,000. Here it can be taken directly into certain of the proposed routes directly or be diverted easterly into the long Huntingtonville level, from which it can be fed in the direction of Lake Ontario into the various other routes.

The annual run-off from the 38 square miles of drainage area above this dam site is 1.9 billion cubic feet. This amount was determined by averaging the mean annual rainfall of a number

of years as recorded by the Federal observers at three characteristic places, and using the run-off coefficient derived for the Black river watershed, there being at present no records of actual run-off on this drainage area, except the determinations by this survey. These readings were begun last year. This 1.9 billion cubic feet of run-off will fill the reservoir and supply the canal after it would leave the river at Watertown. However, as the determination of run-off is at present necessarily theoretical, there is a possibility, that, when the readings of the discharge of the North branch shall have been taken for a full year, the amount caught on this drainage area may prove less than the computations now show. Also, at Adams, which is below the junction of these branches, there are three power plants entitled to the usual summer flow. These plants would suffer in times of drouth, if the North branch was entirely diverted, and in arriving at the amount available for storage, no water has been considered as being spilled from the reservoir to keep up the usual summer flow of this stream.

In case the North branch watershed proves to be inadequate, it can be assisted in the following manner: A dam can be built a short distance below Whitesville on the East branch, which will raise the creek water 40 feet. This elevation will enable a feeder to pass it from the pool thus formed into what is known as Freeman creek, which is a tributary of the North branch, discharging into the proposed reservoir. The cost of the auxiliary dam and feeder would be \$154,000.

INFORMATION ALREADY SUBMITTED FOR LEGISLATIVE PURPOSES.

On March 11, 1912, by direction of State Engineer Bensel, I made a verbal report and submitted in round figures the cost of the most feasible routes. Regarding the size of prism and locks, the following five propositions were offered, and in all of them the 12-foot depth remains unchanged.

- (1) Full Barge canal size of prism and locks throughout.
- (2) Full Barge canal sized locks and a prism of 9 feet less width.
- (3) Locks 188 feet by 28 feet and full Barge canal size of prism.

(4) Locks as in No. 3 with a prism of 9 feet less in width.

(5) Full Barge canal sized locks and prism from Lake Ontario to Watertown, and locks as in No. 3 from Watertown to Carthage with full Barge canal size of prism.

Proposition No. 3 was chosen and a bill printed for same. The cost of this amounted to \$14,000,000, when rounded 15 per cent for contingencies. Later No. 1 was chosen and the first bill withdrawn. A new one was then printed, of which No. 1 forms a part, amounting to \$16,000,000, with a 20 per cent rounding for contingencies. The enlargement of the Glen Falls feeder and the reconstruction of the Chemung canal constitute the rest of the bill. At present writing, April 5, 1912, this bill has passed the Legislature and is in the hands of the Governor.

ESTIMATE.

On the tabulated sheets that follow the amounts of the various lines are shown. Along the different routes a number of projected lines were estimated. Later the best of these were combined into the series indicated by the line numbers. In this manner each route was studied before the lines composing it were selected.

Full sized Barge canal locks, 45 feet wide by 328 feet between hollow quoins, were estimated throughout. Comparison of lines and routes was then made and the most feasible combination selected. Having obtained the three routes which make up the entire canal extension from Carthage to Sacketts Harbor, an estimate, using locks 28 feet wide by 188 feet between hollow quoins, was computed, to show the saving, should the smaller locks be built.

The cost of the extension from Carthage to Sacketts Harbor is in round figures as follows:

For full Barge canal size throughout, \$16,300,000.

For full size, except using the smaller locks, \$14,600,000.

In both of the above amounts, 20 per cent has been added for contingencies to the figures shown by the computations. The attached tabulated sheets show the items briefly, and the detail computations are filed in the office of the Middle Division of the Erie canal at Syracuse.

COMPUTATIONS AND ESTIMATES FOR WATER-SUPPLY.

SUMMARY OF RESERVOIRS AND FEEDERS FOR 45 x 323 Ft. (between H. Q.) Locks.

<i>North Branch, Sandy Creek, Reservoir.</i>	
Dam site, near Whitford Corners.	
Elevation of crest = 740, U. S. G. S. datum.	
Capacity = 1.6 billion cubic feet.	
Run-off = 2.1 billion cubic feet per year.	
Cost of reservoir with earth and concrete dam.....	\$198,000
 <i>Feeder from North Branch to Black River.</i>	
In both open cut and tunnel, length = 12,300 feet.	
Capacity = 140 second-feet.	
Cost.....	150,000
 <i>Deer River Reservoir.</i>	
Dam site, $\frac{1}{2}$ mile above Copenhagen.	
Elevation of crest = 1,220, U. S. G. S. datum.	
Capacity = 0.74 billion cubic feet.	
Run-off = 4.4 billion cubic feet per year.	
Cost of reservoir with earth and concrete dam.....	225,000
 <i>East Branch, Sandy Creek, Reservoir (auxiliary).</i>	
Dam site, $1\frac{1}{2}$ miles west of Whitesville.	
Elevation of crest = 900, U. S. G. S. datum.	
Capacity = 0.12 billion cubic feet.	
Run-off = 1.9 billion cubic feet per year.	
Cost of reservoir with earth and concrete dam.....	72,000
 <i>Feeder from East Branch to North Branch.</i>	
Elevation = 900, U. S. G. S. datum.	
Capacity = 280 second-feet.	
Length of feeder = 13,000 feet.	
Cost.....	82,000
Total.....	<u><u>\$727,000</u></u>

SUMMARY OF RESERVOIRS AND FEEDER FOR 28 x 188 Ft. Locks.

<i>North Branch, Sandy Creek, Reservoir.</i>	
Dam site, near Whitford Corners.	
Elevation of crest = 740, U. S. G. S. datum.	
Capacity = 1.6 billion cubic feet.	
Run-off = 2.1 billion cubic feet per year.	
Cost of reservoir with earth and concrete dam.....	\$198,000
 <i>Feeder from North Branch to Black River.</i>	
In both open cut and tunnel length = 12,300 feet.	
Capacity = 140 second-feet.	
Cost.....	150,000

SUMMARY OF RESERVOIRS AND FEEDER FOR 28x188 Ft. Locks—(Concluded).

Deer River Reservoir.

Dam site, $\frac{1}{2}$ mile above Copenhagen.	
Elevation of crest = 1,220, U. S. G. S. datum.	
Capacity = 0.74 billion cubic feet.	
Run-off = 4.4 billion cubic feet per year.	
Cost of reservoir with earth and concrete dam	\$225,000
Total	<u>\$573,000</u>

Say \$600,000.

WATER REQUIRED FOR 45 x 328 Ft. Locks.

Computations of total amount of water required for one navigation season.

Size of locks = 45 x 328 feet (between hollow quoins).	
Maximum lift to be filled per each lockage = 35 feet.	
Number of lockages = 2,000 per season.	
Length of navigation season = 180 days.	
Total amount of water for lockage — $328 \times 45 \times 35 \times 2,000$. . .	1,033,200,000 cu.ft.
For seepage and other losses, add 25 per cent.	258,300,000
Total	<u>1,291,500,000 cu.ft.</u>

Say 1.25 billion cubic feet per season.

WATER REQUIRED FOR 28 x 188 Ft. Locks.

Computations of total amount of water required for one navigation season.

Size of locks = 28 x 188 feet (between hollow quoins).	
Maximum lift to be filled per each lockage = 35 feet.	
Number of lockages = 2,000 per season.	
Length of navigation season = 180 days.	
Total amount of water for lockage — $188 \times 28 \times 35 \times 2,000$. . .	368,480,000 cu. ft.
For seepage and other losses, add 25 per cent.	92,120,000
Total	<u>460,600,000 cu. ft.</u>

Say 0.46 billion cubic feet per season.

NORTH BRANCH, SANDY CREEK, RESERVOIR.

Computations.

Dam one-half mile from Whitford Corners.
Crest elevation = 740, U. S. G. S. datum.
Capacity of reservoir, contour 740, 1.6 billion cubic feet.*
Length of dam = about 500 feet.
Height of dam = about 40 feet.
Drainage area = 38 square miles.
Average yearly rainfall = 38.56 inches.†
Run-off coefficient = 61 per cent.‡
 $27,878,400 \times \frac{38.56}{12} \times 0.61 = 54,639,280$ cubic feet per square mile.
 $54,639,280 \times 38 = 2.1$ billion cubic feet, yearly run-off.

* Planimetered from U. S. G. S. topographic sheet.
† See U. S. Weather Bureau report for Adams Center, Rutland and Rodman.
‡ See Barge canal report for 1901, page 826.

Quantities in Dam.*

STATION.	Distance.	Embankment.		Concrete.	
		Feet.	Cu. yds. per lin. ft.†	Cu. yds.	Cu. yds. per lin. ft.†
420			0		0
360	60		36	1,080	1.8
340	20		120	1,560	5.0
280	50		200	10,250	8.5
200	400		200	142,100	8.5
300	100		120	20,500	5.0
360	60		36	4,680	1.8
440	80		0	1,440	0
Totals.. ..				181,610	

Embankment, 181,610 cu. yds. at 30 c = \$54,483.
Concrete, 5,576 cu. yds. at \$6.00 = \$33,456.

60 ft. of spillway at 67 cu. yds. per lin. ft.:
60 x 67 = 4,020 cu. yds. in spillway.
4,020 cu. yds. at \$5.00 = \$20,100.

Summary of Cost.

Embankment, 181,610 cu. yds. at 30c.....	\$54,483
Concrete, core wall, 5,576 cu. yds. at \$6.00.....	33,456
Concrete, spillway, 4,020 cu. yds. at \$6.00.....	24,120
Relocated highways, 3 miles at \$3,000.....	9,000
Relocated highways, 12 acres of land at \$.50.....	600
Buildings destroyed, 10 houses at \$1,500.....	15,000
Buildings destroyed, 12 barns at \$700.....	10,800
Buildings destroyed, 1 schoolhouse at \$600.....	600
Land flooded = 1,000 acres at \$.50.....	50,000
Total.....	\$198,059

Say \$198,000.

FEEDER FROM UPPER END OF NORTH BRANCH OF SANDY CREEK TO BLACK RIVER.

Computations and Cost.

Assuming feeder to supply water for 12 lockages of 35 ft. lift:
320 x 45 x 35 = 504,000 cu. ft. for each lockage.
12 x 504,000 = 6,048,000 cu. ft. in 12 hours.
6,048,000 ÷ 43,200 = 140 second-feet.
Assuming velocity of 3 ft. per second, section area = 46.6 sq. ft.
Assuming 12 ft. bottom width and slopes of 1 on 1½:
Area for 6 ft.-cut = 126 sq. ft.
Area for 15 ft.-cut = 517 sq. ft.

* Cross-section of dam site, taken from U. S. Deep Waterway map:
740 720 700 675 675 675 700 720 740
420 360 340 290 00 200 300 360 440
† See Von Schon, pages 42 and 50.

FEEDER FROM UPPER END OF NORTH BRANCH OF SANDY CREEK TO BLACK RIVER —
(Concluded).

Drawing water from reservoir at elevation 710 with average open cut of 15 ft. for 6,800 ft; 3,500 feet of tunnel; then average open cut of 6 ft. for 2,000 ft.:

$\frac{6,800 \times 517}{27} = 130,200$ cu. yds. at 50c.....	\$65,100
3,500 ft. of tunnel at \$20.....	70,000
$\frac{2,000 \times 126}{27} = 9,330$ cu yds. at 50c.....	4,650
For controlling works.....	10,000
Total.....	<u>\$149,750</u>

Say \$150,000

DEER RIVER RESERVOIR.

Computations.

Dam one-half mile above Copenhagen.
Crest elevation = 1,220, U. S. G. S. datum.
Capacity of reservoir, contour 1,220, 0.74 billion cu. ft.†
Length of dam = about 4,000 feet.
Height of dam = about 25 feet.
Area flooded = about 660 acres.

$27,878,400 \times \frac{38.56}{12} \times 0.61 \times 80 = 4.4$ billion cu. ft. yearly run-off.

Quantities in Dam.*

STATION.	Depth.	Distance.	Embankment.		Concrete.	
	<i>Feet.</i>	<i>Feet.</i>	<i>Cu. yds. per lin. ft.†</i>	<i>Cu. yds.</i>	<i>Cu. yds. per lin. ft.†</i>	<i>Cu. yds.</i>
2,300.....	0	.....	0	.....	0	.....
1,400.....	20	900	33	19,850	1.85	832
1,200.....	40	200	120	15,300	4.90	675
00.....	40	1,200	120	144,000	4.90	2,940
2,100.....	20	2,100	33	160,650	1.85	7,087
2,700.....	0	600	0	9,900	0	555
Totals.....	.....	.....	.....	344,700	.....	12,039

Embankment, 344,700 cu. yds. at 30c = \$103,410.
Concrete, core wall, 12,089 cu. yds. at \$6.00 = 72,534.

* Cross-section of dam site, taken from U. S. G. S. topographic sheet:
1220 1200 1180 1180 1200 1220
2300 1400 1200 00 2100 2700
† Taken from Von Schon, page 50.
‡ Planimetered from U. S. G. S. topographic sheet.

Summary of Cost.

Embankment, 344,700 cu. yds. at 30c.....	\$103,410
Concrete, core wall, 12,089 cu. yds. at \$6.00.....	72,534
Concrete, spillway, 2,100 cu. yds. at \$6.00.....	12,600
Relocated highway, 1 mile at \$3,000.....	3,000
Relocated highway, 4 acres of land at \$50.....	200
Land flooded, 616 acres at \$50.....	30,800
Total.....	<u>\$222,544</u>

Say \$225,000.

EAST BRANCH, SANDY CREEK, RESERVOIR.

Computations.

Dam about 1½ miles west of Whitesville.
Crest elevation = 900, U. S. G. S. datum.
Capacity of reservoir, contour 900, 0.12 billion cu. ft.
Length of dam = 500 feet.
Average height of dam = 25 feet.
Drainage area = 35 square miles.
Average rainfall = 38.56 inches.*
Run-off coefficient = 61 per cent.†
 $27,878,400 \times \frac{38.56}{12} \times 0.61 = 54,639,280$ cu. ft. per sq. mi.
 $54,639,280 \times 35 = 1.9$ billion cu. ft., yearly run-off.

Quantities in Dam.‡

STATION.	Depth.	Distance.	Embankment.		Concrete.	
			Cu. yds. per lin. ft.‡	Cu. yds.	Cu. yds. per lin. ft.‡	Cu. yds.
600.....	0	0	0	.....	0	.....
450.....	20	150	35	2,625	1.8	135
300.....	40	150	121	11,700	4.4	465
00.....	50	300	182	45,450	6.6	1,650
200.....	40	200	121	30,300	4.4	1,100
300.....	20	100	35	7,800	1.8	310
400.....	0	100	0	1,750	0	90
Totals.....	.....	.....	.....	99,625	.....	3,750

Embankment, 99,620 cu. yds. at 30c = \$29,886.
Concrete, core wall, 3,750 cu. yds. at \$6.00 = \$22,500.

* See U. S. Weather Bureau report for Adams Center, Rutland and Rodman.
† See Barge canal report for 1931, page 823.
‡ Cross-section of dam-site:
900 880 860 850 860 880 900
600 450 300 00 200 300 400
§ See Von Schon, page 50.

Summary of Cost.

Embankment, 99,620 cu. yds. at 30c.....	\$29,886
Concrete, core wall, 3,750 cu. yds. at \$6.00.....	22,500
Concrete, spillway, 1,500 cu. yds. at \$6.00.....	9,000
Relocated highways, 0.8 mile, at \$3,000.....	2,400
Relocated highways, 4 acres of land, at \$50.....	200
Buildings destroyed, 1 house at \$1,500.....	1,500
Land flooded, 122 acres at \$50.....	6,100
Total.....	\$71,586

Say \$72,000.

FEEDER FROM EAST BRANCH TO NORTH BRANCH, SANDY CREEK.*Computations and Cost.*

Elevation of lower East Branch = 900, U. S. G. S. datum.

Drainage area = 35 square miles.

Average monthly rainfall for Lowville, taken from U. S. Weather Bureau reports for the months, Dec., Jan., Feb. and Mar., 1827-1909 = 3.15, 2.77, 2.76 and 2.48 inches.

Total precipitation in four months = 11.16 inches.

$$27,878,400 \times \frac{11.16}{12} \times 35 \times 0.80 = 725,954,000 \text{ cu. ft.}$$

Stored up precipitation in four months assumed to run off in a period of 30 days:

$$725,954,000 \div 2,592,000 = 280 \text{ second-feet.}$$

Assuming velocity of 3 ft. per second, section area = 93 + or 94 sq. ft.

Assuming 18 ft. bottom width and slopes of 1 on 1½, area for 10 ft.-cut = 330 sq. ft.

Length of feeder = 13,000 feet.

$$\frac{13,000 \times 330}{27} = 158,900 \text{ cu. yds. at 50c.....} \quad \$79,450$$

$$\text{Two bridges at \$1,000.....} \quad 2,000$$

$$\text{Total.....} \quad \underline{\underline{\$81,450}}$$

Say \$82,000.

ESTIMATE OF COSTS OF ALL ROUTES.

Full Barge canal size of prism and locks 45 feet wide by 328 feet long between gates.

MUSKALONGE CREEK ROUTE.— LINES 5, 6, 7, 8 AND 36.

Line No. 5.— Length, 2.61 miles.

Earth excavation, 475,200 cu. yds. at 35c.....	\$166,300
Rock excavation, 272,100 cu. yds. at \$1.50.....	408,200
Embankment, 35,700 cu. yds. at 15c.....	5,400
Locks — lift, 31 ft.....	255,000
Dams.....	0
Bridges — 1 highway.....	12,000
Land damages.....	3,300
Total.....	\$850,200

Line No. 6 — Length, 2.74 miles.

Earth excavation, 154,700 cu. yds. at 35c.....	\$54,200
Rock excavation, 315,300 cu. yds. at \$1.50.....	473,000
Embankment, 245,500 cu. yds. at 15c.....	36,800
Locks — lift, 30 ft.— 25 ft.— 15 ft.....	632,000
Dams.....	0
Bridges — 1 highway.....	12,000
Land damages.....	5,700
Total.....	\$1,213,700

Line No. 7.— Length, 2.56 miles.

Earth excavation.....	0
Rock excavation, 493 000 cu. yds. at \$1 50.....	\$739,500
Embankment, 168,100 cu. yds. at 15c.....	25,200
Locks — lift, 30 ft.— 15 ft.— 15 ft.— 10 ft.....	709,000
Dams.....	0
Bridges — 1 highway.....	12,000
Land damages.....	5,400
Total.....	\$1,491,100

Line No. 8.— Length, 2.81 miles.

Earth excavation, 200,600 cu. yds. at 35c.....	\$70,200
Rock excavation, 597,400 cu. yds. at \$1.50.....	896,100
Embankment, 93,000 cu. yds. at 15c.....	14,000
Locks — lifts, 15 ft.— 20 ft.....	355,000
Lining canal prism.....	83,000

Line No. 8.—Length, 2.81 miles—(Concluded).

Bridges — 2 highway.....	\$24,000
Land damages.....	6,000
Total.....	<u>\$1,448,300</u>

Line No. 36.—Length, 0.36 mile.

Earth excavation.....	0
Rock excavation, 69,840 cu. yds. at \$2.50.....	\$174,600
Embankment.....	0
Locks — lift. 8 ft.....	123,000
Dams 2.....	92,000
Bridges.....	0
Land damages.....	2,400
Total.....	<u>\$392,000</u>

SUMMARY.—Lines chosen, 5, 6, 8, and 36.

Line No. 5.....	\$850,200
Line No. 6.....	1,213,700
Line No. 8.....	1,448,300
Line No. 36.....	392,000
Grand total.....	<u>\$3,904,200</u>

*NORTH WATERTOWN ROUTE.—LINES 9 AND 11.**Line No. 9.—Length, 0.21 mile.*

Earth excavation.....	0
Rock excavation, 3,500 cu. yds. at \$2.50.....	\$8,750
Rock excavation, 50,600 cu. yds. at \$1.50.....	75,900
Embankment.....	0
Locks.....	0
Dams.....	0
Bridges — 2 railroad 1 highway.....	82,000
Land damages.....	900
Total.....	<u>\$167,550</u>

Line No. 11.—Length, 4.18 miles.

Earth excavation, 727,700 cu. yds. at 35c.....	\$254,700
Rock excavation, 680,700 cu. yds. at \$1.50.....	1,021,100
Embankment, 159,900 cu. yds. at 15c.....	24,000
Locks — lift, 12 ft.— 20 ft.— 20 ft.— 30 ft.— 30 ft.....	1,028,000
Dams.....	0
Bridges—4 city, 3 railroad.....	208,000
Land damages.....	26,900
Total.....	<u>\$2,562,700</u>

SUMMARY.—Lines chosen, 9 and 11.

Line No. 9.....	\$167,550
Line No. 11.....	2,550,700
Grand total.....	<u>\$2,730,250</u>

BLACK RIVER ROUTE.— LINES 19, 20, 35, 21, 22, 23, 24, 25, 26, 27, 28 and 29.*Line No. 19.— Length, 0.66 mile.*

Earth excavation.....	0
Rock excavation, 2,000 cu. yds. at \$1.50.....	\$3,000
Embankment.....	0
Locks.....	0
Dams.....	0
Bridges.....	0
Land damages.....	0
Total.....	\$3,000

Line No. 20.— Length 1.81 miles.

Earth excavation.....	0
Rock excavation, 46,300 cu. yds. at \$1.50.....	\$69,450
Embankment, 1,800 cu. yds. at 15c.....	300
Locks— lift, 18 ft.....	180,000
Dams, 1.....	79,000
Bridges.....	0
Land damages.....	0
Total.....	\$328,750

Line No. 35.— Length, 0.32 mile.

Earth excavation.....	0
Rock excavation, 36,500 cu. yds. at \$1.50.....	\$54,750
Embankment.....	0
Locks.....	0
Bridges.....	0
Land damages.....	900
Total.....	\$55,650

Line No. 21.— Length 0.89 mile.

Earth excavation.....	0
Rock excavation, 397,400 cu. yds. at \$1.50.....	\$596,100
Embankment.....	0
Locks — lift, 18 ft.— 20 ft.....	372,000
Dams.....	0
Bridges — 2 highway, 2 railroad.....	104,000
Land damages.....	2,300
Total.....	\$1,074,400

Line No. 22.— Length 1.73 miles.

Earth excavation.....	0
Rock excavation, 281,100 cu. yds. at \$1.50.....	\$421,650
Embankment.....	0
Locks — lift, 22 ft.— 16 ft.....	372,000
Dams, 2.....	63,000
Bridges — 2 highway, 1 railroad.....	64,000
Land damages.....	0
Total.....	\$920,650

BLACK RIVER SURVEY.

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Line No. 23.—Length 4.92 miles.

Earth excavation.....	0
Rock excavation, 515,000 cu. yds. at \$1.50.....	\$772,500
Embankment.....	0
Locks — lift, 14 ft.— 11 ft.— 9 ft.— 18 ft.....	606,000
Dams, 1.....	44,000
Bridges — 2 highway.....	24,000
Land damages.....	10,800
Total.....	\$1,457,300

Line No. 24.—Length 2.65 miles.

Earth excavation.....	0
Rock excavation, 320,400 cu. yds. at \$1.50.....	\$480,600
Embankment.....	0
Locks.....	0
Dams.....	0
Bridges.....	0
Land damages.....	0
Total.....	\$480,600

Line No. 25.—Length 1.68 miles.

Earth excavation.....	0
Rock excavation, 225,400 cu. yds. at \$1.50.....	\$338,100
Embankment, 122,400 cu. yds. at 15c.....	18,400
Locks — lift, 16 ft.— 16 ft.....	338,000
Dams, 1.....	54,000
Bridges — 1 highway.....	12,000
Land damages.....	3,600
Total.....	\$764,100

Line No. 26.—Length 1.55 miles.

Earth excavation.....	0
Rock excavation, 430,200 cu. yds. at \$1.50.....	\$645,300
Embankment.....	0
Locks — lift, 24 ft.— 25 ft.....	435,000
Dams.....	0
Bridges — 1 highway, 1 railroad.....	52,000
Land damages.....	4,100
Total.....	\$1,136,400

Line No. 27.—Length 0.81 mile.

Earth excavation.....	0
Rock excavation, 119,600 cu. yds. at \$1.50.....	\$179,400
Embankment.....	0
Locks — lift, 32 ft.....	260,000
Dams, 1.....	54,000
Bridges.....	0
Land damages.....	0
Total.....	\$493,400

Line No. 28.—Length, 1.24 miles.

Earth excavation.....	0
Rock excavation, 80,900 cu. yds. at \$1.50.....	\$121,350
Embankment, 5,800 cu. yds. at 15c.....	900
Locks — lift, 17 ft.....	174,000
Dams, 1.....	49,000

Line No. 28.—Length 1.24 miles — (Concluded).

Bridges — 1 highway.....	\$12,000
Land damages.....	0
Total.....	\$357,250

Line No. 29.—Length, 5.65 miles.

Earth excavation.....	0
Rock excavation, 557,400 cu. yds. at \$1.50.....	\$836,100
Embankment.....	0
Locks — lift, 16 ft.— 27 ft.— 26 ft.....	627,000
Dam and retaining wall, 1.....	137,000
Bridges — 1 city, 2 railroad.....	102,000
Land damages.....	0
Total.....	\$1,702,100

SUMMARY.— Lines chosen, 19, 20, 35, 21, 23, 24, 26 and 29.

Line No. 19.....	\$3,000
Line No. 20.....	328,750
Line No. 35.....	55,650
Line No. 21.....	1,074,400
Line No. 23.....	1,457,300
Line No. 24.....	480,600
Line No. 26.....	1,136,400
Line No. 29.....	1,702,100
Grand total.....	\$6,238,200

ENTIRE CANAL EXTENSION (CARTHAGE TO SACKETTS HARBOR).**SUMMARY.**

Black River route, lines 19, 20, 35, 21, 23, 24, 26 and 29.....	\$6,238,200
North Watertown route, lines 9 and 11.....	2,730,250
Muskalonge Creek route, lines 5, 6, 8 and 36.....	3,904,200
	\$12,872,650
Water-supply.....	727,000
	\$13,599,650
20 per cent for contingencies.....	2,719,930
Total.....	\$16,319,580
Say.....	\$16,000,000

CAMP'S DITCH ROUTE.— LINES 1, 2, 3 and 4.*Line No. 1.—Length, 4.98 miles.*

Earth excavation, 322,300 cu. yds. at 35c.....	\$112 800
Rock excavation, 1,067,700 cu. yds. at \$1.50.....	1,601,600
Embankment, 202,700 cu. yds. at 15c.....	30,400
Locks — lift, 28 ft.— 28 ft.— 35 ft.— 30 ft.....	1,003,000
Dams.....	0
Bridges — 4 highway, 1 railroad.....	88,000
Land damages.....	10,500
Total.....	\$2,846,300

Line No. 2.—Length, 5.63 miles.

Earth excavation, 1,792,600 cu. yds. at 35c.....	\$627,400
Rock excavation.....	0
Embankment, 184,900 cu. yds. at 15c.....	27,700
Locks — lift, 13 ft.— 10 ft.....	286,000
Dams.....	0
Bridges — 3 highway.....	36,000
Land damages.....	12,800
Total.....	\$989,900

Line No. 3.—Length, 5.60 miles.

Earth excavation, 1,891,800 cu. yds. at 35c.....	\$662,100
Rock excavation.....	0
Embankment, 57,200 cu. yds. at 15c.....	8,600
Locks — lift, 13 ft.— 10 ft.....	286,000
Dams.....	0
Bridges — 3 highway.....	36,000
Land damages.....	12,800
Total.....	\$1,005,500

Line No. 4.—Length, 1.58 miles.

Earth excavation, 762,500 cu. yds. at 35c.....	\$266,900
Rock excavation.....	0
Embankment.....	0
Locks.....	0
Dams, elevation, 370–388.....	50,000
Bridges — 2 highway, 1 railroad.....	64,000
Land damages.....	9,600
Total.....	\$390,500

SUMMARY.—Lines chosen, 1, 2 and 4.

Line No. 1.....	\$2,846,300
Line No. 2.....	989,900
Line No. 4.....	390,500
Grand total.....	\$4,226,700

BEAVER MEADOW ROUTE.—LINES 14, 15, 16, 17, 18, 30, 31, 32, 33 and 34.*Line No. 14.—Length, 4.29 miles.*

Earth excavation, 1,106,600 cu. yds. at 35c.....	\$387,300
Rock excavation, 405,700 cu. yds. at \$1.50.....	608,600
Embankment, 135,077 cu. yds. at 15c.....	20,300
Locks — lift, 30 ft.— 30 ft.— 17 ft.— 25 ft.— 10 ft.....	1,026,000
Dams.....	0
Bridges — 2 highway, 3 city, 1 railroad.....	130,000
Land damages.....	46,500
Total.....	\$2,218,700

Line No. 15.—Length, 0.98 mile.

Earth excavation, 554,500 cu. yds. at 35c.....	\$194,100
Rock excavation, 228,900 cu. yds. at \$1.50.....	343,400
Embankment.....	0
Locks.....	0
Dams.....	0
Bridges — 1 city.....	22,000
Land damages.....	86,000
Total.....	\$645,500

Line No. 16.—Length, 0.71 mile.

Earth excavation, 417,000 cu. yds. at 35c.....	\$146,000
Rock excavation, 268,900 cu. yds. at \$1.50.....	403,400
Embankment.....	0
Locks.....	0
Dams.....	0
Bridges — 1 city.....	22,000
Land damages.....	12,000
Total.....	\$583,400

Line No. 17.—Length, 1.72 miles.

Earth excavation, 564,100 cu. yds. at 35c.....	\$197,400
Rock excavation, 696,800 cu. yds. at \$1.50.....	1,045,200
Embankment.....	0
Locks.....	0
Dams.....	0
Bridges — 1 city.....	22,000
Land damage.....	10,000
Total.....	\$1,275,400

Line No. 18.—Length, 0.35 mile.

Earth excavation, 91,700 cu. yds. at 35c.....	\$32,100
Rock excavation.....	0
Embankment.....	0
Locks.....	0
Dams.....	0
Bridges — 1 city, 1 railroad.....	62,000
Land damages.....	500
Total.....	\$94,600

Line No. 30.—Length, 3.60 miles.

Earth excavation.....	0
Rock excavation, 279,000 cu. yds. at \$1.50.....	\$418,500
Embankment.....	0
Locks.....	0
Dams.....	0
Bridges — 1 city.....	22,000
Land damages.....	19,000
Total.....	\$459,500

Line No. 31.—Length, 1.18 miles.

Earth excavation, 183,900 cu. yds. at 35c.....	\$64,400
Rock excavation.....	0
Embankment.....	0
Locks.....	0
Dams, 18 ft.....	63,200
Bridges — 1 railroad, 2 highway.....	64,000
Land damages.....	0
Total.....	\$191,600

Line No. 32.—Length, 0.23 mile.

Earth excavation, 132,800 cu. yds. at 35c.....	\$46,500
Rock excavation.....	0
Embankment.....	0
Locks.....	0
Dams.....	0
Bridges.....	0
Land damages.....	1,600
Total.....	\$48,100

Line No. 33.—Length, 0.79 mile.

Earth excavation, 490,500 cu. yds. at 35c.....	\$171,700
Rock excavation.....	0
Embankment.....	0
Locks.....	0
Dams.....	0
Bridges — 1 city.....	22,000
Land damages.....	3,400
Total.....	\$197,100

Line No. 34.—Length, 0.44 mile.

Rock excavation, 2,900 cu. yds. at \$1.50.....	\$4,350
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SUMMARY.—Lines chosen, 14, 15, 32, 33, 18 and 34.

Line No. 14.....	\$2,218,700
Line No. 15.....	645,500
Line No. 32.....	48,100
Line No. 33.....	197,100
Line No. 18.....	94,600
Line No. 34.....	4,350
Grand total.....	\$3,208,350

*SANDFORD CORNERS ROUTE.—LINES 10, 12 and 13.**Line No. 10.—Length, 5.25 miles.*

Earth excavation.....	0
Rock excavation, 1,449,900 cu. yds. at \$1.50.....	\$2,174,900
Embankment, 196,800 cu. yds. at 15c.....	29,500
Locks — lifts, 12 ft.— 15 ft.— 10 ft.— 15 ft.— 30 ft.— 30 ft.....	1,104,000
Dams.....	0
Bridges — 1 city, 1 railroad, 3 highway.....	98,000
Land damages.....	11,200
Total.....	\$3,417,600

Line No. 12.—Length, 1.17 miles.

Earth excavation, 1,029,800 cu. yds. at 35c.....	\$360,500
Rock excavation.....	0
Embankment.....	0
Locks.....	0
Dams.....	0
Bridges — 1 highway.....	12,000
Land damages.....	2,400
Total.....	\$374,900

Line No. 13.—Length, 2.17 miles.

Earth excavation, 761,200 cu. yds. at 35c.....	\$266,400
Rock excavation.....	0
Embankment.....	0
Locks — lift, 18 ft.....	180,000
Dams, one — 28 ft.....	79,000
Bridges — 1 highway.....	12,000
Land damages.....	4,600
Total.....	\$542,600

SUMMARY.—Lines chosen, 10 and 13.

Line No. 10.....	\$3,417,600
Line No. 13.....	542,600
Grand total.....	\$3,960,200

*DEXTER ROUTE.—LINES 41 and 44.**Line No. 41.—Length, 5.60 miles.*

Rock excavation, 552,155 cu. yds. at \$2.50.....	\$1,380,400
Widening channel — Ontario mill.....	10,000
Locks — lifts, 23 ft.— 28 ft.— 23 ft.— 20 ft.— 29 ft.— 8 ft.....	1,214,000
One dam and gates — 2 Taintor gates.....	118,000
Land damages.....	237,700
Aqueduct, 1,300 ft. long.....	130,000
Total.....	\$3,090,100

Line No. 44.—Length, 3.63 miles.

Earth excavation, 355,959 cu. yds. at 20c.....	\$71,200
Rock excavation, 173,074 cu. yds. at \$3.00.....	519,300
Rock excavation, 33,814 cu. yds. at \$2.50.....	84,600
Locks — lift, 12 ft.....	146,000
Cribs — length, 2 miles.....	200,000
Land damages.....	54,000
Total.....	\$1,075,100

SUMMARY.—Lines chosen, 41 and 44.

Line No. 41.....	\$3,090,100
Line No. 44.....	1,075,100
Grand total.....	\$4,165,200

3,600
9,000
3,840

6,440

6,440

9,500
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4,100

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8,600

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2,250

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BASIN ROUTE.— LINE 43.

Line No. 43.— Length, 1.81 miles.

Rock excavation, 642,385 cu. yds. at \$1.50.....	\$963,600
Locks — lifts, 30 ft.— 26 ft.— 10 ft.....	609,000
Land damages.....	3,840
Total.....	\$1,576,440
Cost of route.....	\$1,576,440

CITY RIVER ROUTE.— LINE 42.

Line No. 42.— Length, 4.55 miles.

Rock excavation, 559,800 cu. yds. at \$2.50.....	\$1,399,500
Locks — lifts, 6 ft.— 34 ft.— 17 ft.— 19 ft.— 7 ft.— 30 ft.....	1,110,000
Bridges — 1 railroad lift, 1 highway lift.....	115,000
Land damages.....	534,100
Total.....	\$3,158,600
Cost of route.....	\$3,158,600

RUTLAND HOLLOW ROUTE.— LINES 37, 38, 39 and 40.

Line No. 37.— Length, 7.76 miles

Earth excavation, 790,500 cu. yds. at 35c.....	\$276,700
Rock excavation, 1,435,900 cu. yds. at \$1.50.....	2,153,850
Embankment, 381,500 cu. yds. at 15c.....	57,300
Locks — lift, 32 ft.— 32 ft.— 32 ft.— 32 ft.— 32 ft.— 20 ft.— 20 ft.— 26 ft...	1,910 000
Dams.....	0
Bridges — 4 highway at \$12,000.....	48,000
Land damages.....	16,400
Total.....	\$4,462,250

Line No. 38.— Length, 3.46 miles.

Earth excavation, 1,176,200 cu. yds. at 35c.....	\$411,700
Rock excavation.....	0
Embankment, 417,900 cu. yds. at 15c.....	62,700
Locks.....	0
Dams.....	0
Bridges — 5 highway at \$12,000.....	60,000
Land damages.....	7,300
Total.....	\$541,700

Line No. 39.— Length, 2.65 miles.

Earth excavation, 346,900 cu. yds. at 35c.....	\$121,500
Rock excavation.....	0
Embankment, 1,394,800 cu. yds. at 15c.....	209,300
Locks.....	0
Dams.....	0
Bridges — 4 highway at \$12,000.....	48,000
Land damages.....	5,600
Total.....	\$384,400

Line No. 40.— Length, 5.41 miles.

Earth excavation, 1,785,300 cu. yds. at 35c.....	\$624,900
Rock excavation.....	0
Embankment, 300,800 cu. yds. at 15c.....	45,200
Locks.....	0
Dams.....	0
Bridges — 4 highway.....	48,000
Land damages.....	11,500
Total.....	\$729,600

SUMMARY.— Lines chosen, 37, 39 and 40.

Line No. 37.....	\$4,462,250
Line No. 39.....	384,400
Line No. 40.....	729,600
Grand total.....	\$5,576,250

ESTIMATE OF COSTS OF SELECTED ROUTES.

Full Barge canal size of prism and locks 28 feet wide by 188 feet long, between gates.

MUSKALONGE CREEK ROUTE.— LINES 5, 6, 7, 8 and 36.

Line No. 5.— Length, 2.61 miles.

Earth excavation, 475,200 cu. yds. at 35c.....	\$166,300
Rock excavation, 272,100 cu. yds. at \$1.50.....	408,200
Embankment, 35,700 cu. yds. at 15c.....	5,400
Locks — lift, 31 ft.....	188,000
Dams.....	0
Bridges — 1 highway.....	12,000
Land damages.....	3,300
Total.....	\$783,200

Line No. 6.— Length, 2.74 miles.

Earth excavation, 154,700 cu. yds. at 35c.....	\$54,200
Rock excavation, 315,300 cu. yds. at \$1.50.....	473,000
Embankment, 245,500 cu. yds. at 15c.....	36,800
Locks — lift, 30 ft.— 25 ft.— 15 ft.....	468,000
Dams.....	0
Bridges — 1 highway.....	12,000
Land damages.....	5,700
Total.....	\$1,049,700

Line No. 7.— Length, 2.56 miles.

Earth excavation.....	0
Rock excavation, 493,000 cu. yds. at \$1.50.....	\$739,500
Embankment, 168,100 cu. yds. at 15c.....	25,200
Locks — lift, 30 ft.— 15 ft.— 15 ft.— 10 ft.....	523,000
Dams.....	0
Bridges — 1 highway.....	12,000
Land damages.....	5,400
Total.....	\$1,305,100

Line No. 8.—Length, 2.81 miles.

Earth excavation, 200,600 cu. yds. at 35c.....	\$70,200
Rock excavation, 597,400 cu. yds. at \$1.50.....	896,100
Embankment, 93,000 cu. yds. at 15c.....	14,000
Locks — lift, 15 ft.— 20 ft.....	264,000
Lining canal prism.....	83,000
Bridges — 2 highway.....	24,000
Land damages.....	6,000
Total.....	\$1,357,300

Line No. 36.—Length, 0.36 mile.

Earth excavation.....	0
Rock excavation, 69,840 cu. yds. at \$2.50.....	\$174,600
Embankment.....	0
Locks — lift, 8 ft.....	88,000
Dams, 2.....	92,000
Bridges.....	0
Land damages.....	2,400
Total.....	\$357,000

SUMMARY.—Lines chosen, 5, 6, 8 and 36.

Line No. 5.....	\$783,200
Line No. 6.....	1,049,700
Line No. 8.....	1,357,300
Line No. 36.....	357,000
Grand total.....	\$3,547,200

*NORTH WATERTOWN ROUTE.—LINES 9 AND 11.**Line No. 9.—Length, 0.21 mile.*

Earth excavation.....	0
Rock excavation, 3,500 cu. yds. at \$2.50.....	\$8,750
Rock excavation, 50,600 cu. yds. at \$1.50.....	75,900
Embankment.....	0
Locks.....	0
Dams.....	0
Bridges — 2 railroad, 1 highway.....	82,000
Land damages.....	900
Total.....	\$167,550

Line No. 11.—Length, 4.18 miles.

Earth excavation, 727,700 cu. yds. at 35c.....	\$254,700
Rock excavation, 680,700 cu. yds. at \$1.50.....	1,021,100
Embankment, 159,900 cu. yds. at 15c.....	24,000
Locks — lift, 12 ft.— 20 ft.— 20 ft.— 30 ft.— 30 ft.....	761,000
Dams.....	0
Bridges — 4 city, 3 railroad.....	208,000
Land damages.....	26,900
Total.....	\$2,295,700

SUMMARY.—Lines chosen, 9 and 11.

Line No. 9.....	\$167,550
Line No. 11.....	2,295,700
Grand total.....	\$2,463,250

BLACK RIVER ROUTE.— LINES 19, 20, 35, 21, 22, 23, 24, 25, 26, 27, 28 and 29.

Line No. 19.— Length, 0.66 mile.

Earth excavation.....	0
Rock excavation, 2,000 cu. yds. at \$1.50.....	\$3,000
Embankment.....	0
Locks.....	0
Dams.....	0
Bridges.....	0
Land damages.....	0
Total.....	\$3,000

Line No. 20.— Length, 1.81 miles.

Earth excavation.....	0
Rock excavation, 46,300 cu. yds. at \$1.50.....	\$69,450
Embankment, 1,800 cu. yds. at 15c.....	300
Locks — lift, 18 ft.....	134,000
Dams.....	79,000
Bridges.....	0
Land damages.....	0
Total.....	\$282,750

Line No. 35.— Length, 0.32 mile.

Earth excavation.....	0
Rock excavation, 36,500 cu. yds. at \$1.50.....	\$54,750
Embankment.....	0
Locks.....	0
Dams.....	0
Bridges.....	0
Land damages.....	900
Total.....	\$55,650

Line No. 21.— Length, 0.89 mile.

Earth excavation.....	0
Rock excavation, 397,400 cu. yds. at \$1.50.....	\$596,100
Embankment.....	0
Locks — lift, 18 ft.— 20 ft.....	277,000
Dams.....	0
Bridges — 2 highway, 2 railroad.....	104,000
Land damages.....	2,300
Total.....	\$879,400

Line No. 22.— Length, 1.73 miles.

Earth excavation.....	0
Rock excavation, 281,100 cu. yds. at \$1.50.....	\$421,650
Embankment.....	0
Locks — lift, 22 ft.— 16 ft.....	276,000
Dams, 2.....	63,000
Bridges — 2 highway, 2 railroad.....	64,000
Land damages.....	0
Total.....	\$824,650

Line No. 23.— Length, 4.92 miles.

Earth excavation	0
Rock excavation, 515,000 cu. yds. at \$1.50	\$772,500
Embankment	0
Locks	445,000
Dams, 1	44,000
Bridges	24,000
Land damages	10,800
Total	\$1,296,300

Line No. 24.— Length, 2.65 miles.

Earth excavation	0
Rock excavation, 320,400 cu. yds. at \$1.50	\$480,600
Embankment	0
Locks	0
Dams	0
Bridges	0
Land damages	0
Total	\$480,600

Line No. 25.— Length, 1.68 miles.

Earth excavation	0
Rock excavation, 225,400 cu. yds. at \$1.50	\$338,100
Embankment, 122,400 cu. yds. at 15c	18,400
Locks — lift, 16 ft.— 16 ft.	250,000
Dams, 1	54,000
Bridges — 1 highway	12,000
Land damages	3,600
Total	\$676,100

Line No. 26.— Length, 1.55 miles.

Earth excavation	0
Rock excavation, 430,200 cu. yds. at \$1.50	\$645,300
Embankment	0
Locks — lift, 24 ft.— 25 ft.	323,000
Dams	0
Bridges — 1 highway, 1 railroad	52,000
Land damages	4,100
Total	\$1,024,400

Line No. 27.— Length, 0.80 mile.

Earth excavation	0
Rock excavation, 119,600 cu. yds. at \$1.50	\$179,400
Embankment	0
Locks — lift, 32 ft.	191,000
Dams, 1	54,000
Bridges	0
Land damages	0
Total	\$424,400

Line No. 28.— Length, 1.24 miles.

Earth excavation.....	0
Rock excavation, 80,900 cu. yds. at \$1.50.....	\$121,350
Embankment, 5,800 cu. yds. at 15c.....	900
Locks — lift, 17 ft.....	129,000
Dams, 1.....	49,000
Bridges — 1 highway.....	12,000
Land damages.....	0
Total.....	<u>\$312,250</u>

Line No. 29.— Length, 5.65 miles.

Earth excavation.....	0
Rock excavation, 557,400 cu. yds. at \$1.50.....	\$836,100
Embankment.....	0
Locks — lift, 16 ft.— 27 ft.— 26 ft.....	464,000
Dams and retaining wall, 1.....	137,000
Bridges — 1 city, 2 railroad.....	102,000
Land damages.....	0
Total.....	<u>\$1,539,100</u>

SUMMARY.— Lines chosen, 19, 20, 35, 21, 23, 24, 26 and 29.

Line No. 19.....	\$3,000
Line No. 20.....	282,750
Line No. 35.....	55,650
Line No. 21.....	879,400
Line No. 23.....	1,296,300
Line No. 24.....	480,600
Line No. 26.....	1,024,400
Line No. 29.....	1,539,100
Grand total.....	<u>\$5,561,200</u>

ENTIRE CANAL EXTENSION (CARTHAGE TO SACKETTS HARBOR).

SUMMARY.

Black River route — lines 19, 20, 35, 21, 23, 24, 26 and 29.....	\$5,561,200
North Watertown route — lines 9 and 11.....	2,463,250
Muskalonge Creek route — lines 5, 6, 8 and 36.....	3,547,200
	<u>\$11,571,650</u>
Water-supply.....	600,000
	<u>\$12,171,650</u>
20 per cent for contingencies.....	2,434,330
Total.....	<u>\$14,605,980</u>
Say.....	<u>\$14,600,000</u>

REPORT
OF
Coöperation of United States Geological
Survey

WITH
STATE ENGINEER AND SURVEYOR

OF THE
STATE OF NEW YORK

1912

Coöperative Topographic Survey of New York.

DEPARTMENT OF THE INTERIOR,
UNITED STATES GEOLOGICAL SURVEY,
WASHINGTON.

OFFICE OF THE DIRECTOR.

November 6, 1912.

Hon. JOHN A. BENSEL, *State Engineer and Surveyor, Albany,
New York:*

SIR.— I have the honor to transmit herewith a report made by Frank Sutton, Geographer in charge of the Atlantic Division of this Survey, on results of topographic work prosecuted in the State of New York during the year January 1, 1912, to December 31, 1912.

This report gives merely the facts concerning the results accomplished and if you desire fuller details concerning the work, or explanation of coöperation to be embodied in the report over your signature, this Survey will be glad to furnish such data.

Very respectfully,

GEO. H. ASHLEY,
Acting Director.

REPORT OF TOPOGRAPHIC SURVEYS IN COÖPERATION BETWEEN
THE UNITED STATES GEOLOGICAL SURVEY AND THE STATE
OF NEW YORK FOR THE CALENDAR YEAR ENDED
DECEMBER 31, 1912.

In accordance with the coöperative agreement signed August 24, 1912, by George Otis Smith, Director, for the United States Geological Survey, and John A. Benschel, State Engineer and Surveyor, August 28, 1912, for the State of New York, the Federal Survey allotted \$10,000 and the State \$10,000, for coöperative topographic surveys in the State of New York during the fiscal year July 1, 1912, to June 30, 1913:

The following is a summary of the field and office work accomplished during the above period under the general direction of R. B. Marshall, Chief Geographer, and under the immediate supervision of Frank Sutton, Geographer of the Atlantic Division.

The work from January 1 to June 30, 1912, was continued under the appropriation for the fiscal year ended June 30, 1912, the results accomplished during the first six months of that year being given in the report of the State Engineer and Surveyor for 1911.

FIELD WORK.

Quadrangle No.	Quadrangle.	COUNTIES.	Pub- lished on scale of	Area mapped.	PRIMARY LEVELS.		TRAVERSE.		
					Miles.	Perma- nent. B. M.'s.	PRIMARY.		SECOND- ARY.
							Miles.	Marks.	
				Sq. miles.					
111	Bonaparte....	Jefferson, Lewis and St. Lawrence.....	1 : 62,500	63	57	14	40	2	509
181	Chateaugay....	Franklin and Clinton.	1 : 62,500	.....	.....	.....	44	4	63
55	Corning.....	Steuben.....	1 : 62,500	222	57	10	.....	.....	581
123	Edwards.....	St. Lawrence.....	1 : 62,500	.....	.....	.....	14	1	.....
199	Ellenburg.....	Franklin and Clinton.	1 : 62,500	212	71	24	.....	.....	588
110	Gouverneur... St. Lawrence.....		1 : 62,500	.....	.....	.....	50	4	.....
125	Number Four... Herkimer and Lewis..		1 : 62,500	156	.....	.....	.....	.....	747
Totals.....				653	185	48	148	11	2,488

The following members of the United States Geological Survey were engaged in the field work:

Topographic Mapping:

J. F. McBeth, topographer.
 J. M. Whitman, topographer.
 W. H. S. Morey, assistant topographer.
 T. F. Slaughter, assistant topographer.
 Roscoe Reeves, junior topographer.
 E. E. Witherspoon, junior topographer.

Primary Traverse and Triangulation:

C. B. Kendall, topographer.

Levels:

R. A. Kiger, assistant topographer.
 H. S. Senseney, junior topographer.
 K. W. Trimble, topographic aid.

OFFICE WORK.

The office drafting of the Dannemora, Lowville and Lyon Mountain topographic maps was completed and the maps transmitted for engraving prior to December 31, 1912.

The adjustment of the levels for the Ellenburg quadrangle was completed and the field notes typewritten and prepared for publication.

Final computations for the geodetic positions of the Corning quadrangle were completed and prepared for publication.

Final computations for the geographic positions of the Bonaparte, Gouverneur, Chateaugay and Ellenburg quadrangles were completed and the results typewritten and prepared for publication.

DEPARTMENT OF THE INTERIOR,
UNITED STATES GEOLOGICAL SURVEY,
WASHINGTON.

OFFICE OF THE DIRECTOR.

November 13, 1912.

MR. ARNOLD G. CHAPMAN, *Deputy State Engineer, Albany, New York:*

Sir.— In reply to your letter of November 9:

There is enclosed herewith a detailed report of topographic work in the State of New York, to be embodied in the State Engineer's annual report. This report is supplementary to the report sent the State Engineer on November 6.

Very respectfully,

GEO. OTIS SMITH,
Director.

COOPERATIVE TOPOGRAPHIC SURVEY OF THE STATE OF NEW YORK.

(Supplementary to the report furnished the State Engineer and
Surveyor, November 6, 1912.)

Prior to January 1, 1912, there had been surveyed 222 quadrangles, representing the topography of 42,374 square miles, and there was mapped, in addition, 66 square miles on two partially surveyed sheets. To the close of the present year, therefore, there have been surveyed and mapped 225 quadrangles, representing the topography of 43,024 square miles.

There have been engraved and published to the close of the present year 247 atlas sheets, covering an area of 41,733 square miles. A number of these sheets are combinations of the separate atlas sheets or are reductions of the same on the less detailed scale of about two miles to one inch. These smaller scale maps are found most useful, as each represents within the limits of an atlas sheet of convenient size an area four times as great as that represented upon the larger scale maps, or about 880 square miles per sheet. These additional sheets are published by the Federal Survey at no expense to the State.

All the atlas sheets completed during 1911 were drawn up in the office during the winter of 1911-1912 and were turned over to the engraver for publication. Those remaining in the hands of the engraver are the following, representing an area of 641 square miles:

Sheet names.	Counties.	Area.
		<i>Square miles.</i>
Lowville.....	Lewis.....	215.51
Lyon Mountain.....	Clinton and Franklin.....	212.82
Dannemora.....	Clinton.....	212.82
Total.....	.....	641.15

Attached hereto is a list of all published topographic maps in the State of New York, to December 31, 1912, together with the Dannemora, Lowville and Lyon Mountain sheets, which it is expected will be published during the coming year.

Published Topographic Maps in New York State.

NAME OF ATLAS SHEET.	POSITION OF SOUTH-EAST CORNER OF SHEET.		Area covered.	Contour interval.	Scale.
	Latitude.	Longitude.			
Albany <i>a</i>	42° 30'	73° 45'	1/16 degree	<i>Feet.</i> 20	1 : 62,500
Albany and vicinity <i>a</i>	42° 30'	73° 30'	1/4 degree	20	1 : 62,500
Albion	43° 00'	78° 00'	1/16 degree	20	1 : 62,500
Alexandria Bay	44° 15'	75° 45'	do	20	1 : 62,500
Amsterdam	42° 45'	74° 00'	do	20	1 : 62,500
Angelica <i>b</i>	42° 15'	78° 00'	do	20	1 : 62,500
Antwerp	44° 00'	75° 30'	do	20	1 : 62,500
Apalachin <i>c</i>	42° 00'	76° 00'	do	20	1 : 62,500
Attica	42° 45'	78° 15'	do	20	1 : 62,500
Auburn	42° 45'	76° 30'	do	20	1 : 62,500
Ausable <i>d</i>	44° 15'	73° 30'	do	20	1 : 62,500
Babylon <i>e</i>	40° 30'	73° 15'	do	20	1 : 62,500
Baldwinsville	43° 00'	76° 15'	do	20	1 : 62,500
Batavia	42° 45'	78° 00'	do	20	1 : 62,500
Bath	42° 15'	77° 15'	do	20	1 : 62,500
Berlin (N. Y. - Mass. - Vt.) <i>f</i>	42° 30'	73° 15'	do	20	1 : 62,500
Berne	42° 30'	74° 00'	do	20	1 : 62,500
Big Moose	43° 45'	74° 45'	do	20	1 : 62,500
Binghamton	42° 00'	75° 45'	do	20	1 : 62,500
Blue Mountain	43° 45'	74° 15'	do	20	1 : 62,500
Bolton	43° 30'	73° 30'	do	20	1 : 62,500
Boonville	43° 15'	75° 15'	do	20	1 : 62,500
Brier Hill	44° 30'	75° 30'	do	20	1 : 62,500
Broadalbin	43° 00'	74° 00'	do	20	1 : 62,500
Brockport	43° 00'	77° 45'	do	20	1 : 62,500
Brooklyn <i>g</i>	40° 30'	73° 45'	do	20	1 : 62,500
Buffalo <i>h</i>	42° 45'	78° 45'	do	20	1 : 62,500
Caledonia	42° 45'	77° 45'	do	20	1 : 62,500
Cambridge (N. Y. - Vt.) <i>i</i>	43° 00'	73° 15'	do	20	1 : 62,500
Canada Lake. Name changed — See West Canada Lakes.					
Canajoharie	42° 45'	74° 30'	do	20	1 : 62,500
Canandaigua	42° 45'	77° 15'	do	20	1 : 62,500
Canton	44° 30'	75° 00'	do	20	1 : 62,500
Cape Vincent	44° 00'	76° 15'	do	20	1 : 62,500
Carmel (N. Y. - Conn.)	41° 15'	73° 30'	do	20	1 : 62,500
Carthage	43° 45'	75° 30'	do	20	1 : 62,500
Castleton (Vt. - N. Y.)	43° 30'	73° 00'	do	20	1 : 62,500
Catatonk <i>j</i>	42° 00'	76° 00'	1/4 degree	40	1 : 125,000
Catskill	42° 00'	73° 45'	1/16 degree	20	1 : 62,500
Cazenovia	42° 45'	75° 45'	do	20	1 : 62,500
Chautauqua	42° 00'	79° 15'	do	20	1 : 62,500
Cherry Creek	42° 15'	79° 00'	do	20	1 : 62,500
Chittenango	43° 00'	75° 45'	do	20	1 : 62,500
Clayton	44° 00'	76° 00'	do	20	1 : 62,500
Clove (N. Y. - Conn.)	41° 30'	73° 30'	do	20	1 : 62,500
Clyde	43° 00'	76° 45'	do	20	1 : 62,500
Clymer	42° 00'	79° 30'	do	20	1 : 62,500
Cohoes <i>k</i>	42° 45'	73° 30'	do	20	1 : 62,500
Cooperstown	42° 30'	74° 45'	do	20	1 : 62,500

a Albany and vicinity map includes Albany, Cohoes, Schenectady and Troy sheets.

b Shows wooded areas.

c Apalachin, Dryden, Harford and Owego sheets, on scale of 1 : 62,500, have been reduced and form Catatonk sheet, on scale of 1 : 125,000.

d Mount Marcy and vicinity map includes Ausable, Elizabethtown, Lake Placid and Mount Marcy sheets. Mount Marcy and vicinity forestry map uses the same base.

e Babylon, Fire Island, Northport and Setauket sheets, on scale of 1 : 62,500, have been reduced and form Islip sheet, on scale of 1 : 125,000.

f Berlin and Hoosick sheets, on scale of 1 : 62,500, have been reduced and form parts of Taconic sheet, on scale of 1 : 125,000.

g New York City and vicinity map includes Brooklyn, Harlem, Paterson, Staten Island, and parts of Hempstead, Oyster Bay and Sandy Hook sheets.

h Niagara River and vicinity map includes parts of all sheets bordering on Niagara river.

i Cambridge, Fort Ann and Pawlet sheets, on scale of 1 : 62,500, have been reduced and form parts of Mettawee sheet, on scale of 1 : 125,000.

j Apalachin, Dryden, Harford and Owego sheets, on scale of 1 : 62,500, have been reduced and form Catatonk sheet, on scale of 1 : 125,000.

k Albany and vicinity map includes Albany, Cohoes, Schenectady and Troy sheets.

Published Topographic Maps in New York State — Continued.

NAME OF ATLAS SHEET.	POSITION OF SOUTH-EAST CORNER OF SHEET.		Area covered.	Contour interval.	Scale.
	Latitude.	Longitude.			
Copake (N. Y.— Mass.).....	42° 00'	73° 30'	1/16 degree	<i>Feet.</i> 20	1 : 62,500
Cornwall (Conn.— N. Y.) <i>l</i>	41° 45'	73° 15'	do	20	1 : 62,500
Cortland.....	42° 30'	76° 00'	do	20	1 : 62,500
Coxsackie.....	42° 15'	73° 45'	do	20	1 : 62,500
Delhi.....	42° 15'	74° 75'	do	20	1 : 62,500
Depew.....	42° 45'	78° 30'	do	20	1 : 62,500
Dannemora.....	44° 30'	73° 30'	do	20	1 : 62,500
Dryden <i>m</i>	42° 15'	76° 15'	do	20	1 : 62,500
Dunkirk.....	42° 15'	79° 15'	do	20	1 : 62,500
Durham.....	42° 15'	74° 00'	do	20	1 : 62,500
Easthampton.....	40° 45'	72° 00'	do	20	1 : 62,500
Eden.....	42° 30'	78° 45'	do	20	1 : 62,500
Elizabethtown <i>n</i>	44° 00'	73° 30'	do	20	1 : 62,500
Ellenville.....	41° 30'	74° 15'	do	20	1 : 62,500
Elmira (N. Y.— Pa.) <i>o</i>	42° 00'	76° 45'	do	20	1 : 62,500
Fire Island <i>p</i>	40° 30'	73° 00'	do	20	1 : 62,500
Fonda.....	42° 45'	74° 15'	do	20	1 : 62,500
Fort Ann (N. Y.— Vt.) <i>q</i>	43° 15'	73° 15'	do	20	1 : 62,500
Fulton <i>r</i>	43° 15'	76° 15'	do	20	1 : 62,500
Gaines (Pa.— N. Y.).....	41° 45'	77° 30'	do	20	1 : 62,500
Gardiners Island.....	41° 00'	72° 00'	do	20	1 : 62,500
Geneva.....	42° 45'	76° 45'	do	20	1 : 62,500
Genoa.....	42° 30'	76° 30'	do	20	1 : 62,500
Gilboa.....	42° 15'	74° 15'	do	20	1 : 62,500
Glens Falls.....	43° 15'	73° 30'	do	20	1 : 62,500
Gloversville.....	43° 00'	74° 15'	do	20	1 : 62,500
Goshen (N. Y.— N. J.).....	41° 15'	74° 15'	do	20	1 : 62,500
Greene.....	42° 15'	75° 45'	do	20	1 : 62,500
Greenwood Lake (N. J.— N. Y.)...	41° 00'	74° 15'	do	20	1 : 62,500
Grindstone.....	44° 15'	76° 00'	do	20	1 : 62,500
Hamlin.....	43° 15'	77° 45'	do	20	1 : 62,500
Hammondsport.....	42° 15'	77° 00'	do	20	1 : 62,500
Hammond.....	44° 15'	75° 30'	do	20	1 : 62,500
Harford <i>s</i>	42° 15'	76° 00'	do	20	1 : 62,500
Harlem (N. Y.— N. J.) <i>t</i>	40° 45'	73° 45'	do	20	1 : 62,500
Hartwick.....	42° 30'	75° 00'	do	20	1 : 62,500
Hempstead <i>l</i>	40° 30'	73° 30'	do	20	1 : 62,500
Highmarket.....	43° 30'	75° 30'	do	20	1 : 62,500
Hobart.....	42° 15'	74° 30'	do	20	1 : 62,500
Honeoye.....	42° 45'	77° 30'	do	20	1 : 62,500
Hoosick (N. Y.— Vt.) <i>u</i>	42° 45'	73° 15'	do	20	1 : 62,500
Housatonic (Mass.— N.Y.— Conn.) <i>v</i>	42° 00'	73° 00'	1/4 degree	40	1 : 125,000
Indian Lake.....	43° 30'	74° 15'	1/16 degree	20	1 : 62,500
Islip <i>w</i>	40° 30'	73° 00'	1/4 degree	20	1 : 125,000

l Cornwall sheet, on scale of 1 : 62,500, has been reduced and forms part of Litchfield sheet, on scale of 1 : 125,000.
m Apalachin, Dryden, Harford and Owego sheets, on scale of 1 : 62,500, have been reduced and form Catatonk sheet, on scale of 1 : 125,000.
n Mount Marcy and vicinity map includes Ausable, Elizabethtown, Lake Placid and Mount Marcy sheets. Mount Marcy and vicinity forestry map uses the same base.
o Elmira, Ithaca, Watkins and Waverly sheets, on scale of 1 : 62,500, have been reduced and form Watkins Glen sheet, on scale of 1 : 125,000.
p Babylon, Fire Island, Northport and Setauket sheets, on scale of 1 : 62,500, have been reduced and form Islip sheet, on scale of 1 : 125,000.
q Cambridge, Fort Ann and Pawlet sheets, on scale of 1 : 62,500, have been reduced and form parts of Mettawee sheet, on scale of 1 : 125,000.
r Oswego special sheet includes parts of Oswego and Fulton sheets.
s Apalachin, Dryden, Harford and Owego sheets, on scale of 1 : 62,500, have been reduced and form Catatonk sheet, on scale of 1 : 125,000.
t New York City and vicinity map includes Brooklyn, Harlem, Paterson, Staten Island, and parts of Hempstead, Oyster Bay and Sandy Hook sheets.
u Berlin and Hoosick sheets, on scale of 1 : 62,500, have been reduced and form parts of Taconic sheet, on scale of 1 : 125,000.
v Pittsfield and Sheffield sheets, on scale of 1 : 62,500, have been reduced and form parts of sheet, on scale of 1 : 125,000.
w Babylon, Fire Island, Northport and Setauket sheets, on scale of 1 : 62,500, have been reduced and form Islip sheet, on scale of 1 : 125,000.

Published Topographic Maps in New York State — Continued.

NAME OF ATLAS SHEET.	POSITION OF SOUTH-EAST CORNER OF SHEET.		Area covered.	Contour interval.	Scale.
	Latitude.	Longitude.			
				<i>Feet.</i>	
Ithaca <i>x</i>	42° 15'	76° 30'	1/16 degree	20	1 : 62,500
Jamestown.....	42° 00'	79° 00'	do	20	1 : 62,500
Kaaterskill.....	42° 00'	74° 00'	do	20	1 : 62,500
Kasoag <i>y</i>	43° 15'	75° 45'	do	20	1 : 62,500
Kinderhook.....	42° 15'	73° 30'	do	20	1 : 62,500
Lake Placid <i>z</i>	44° 15'	73° 45'	do	20	1 : 62,500
Lake Pleasant.....	43° 15'	74° 15'	do	20	1 : 62,500
Lawellsville.....	43° 00'	74° 30'	do	20	1 : 62,500
Litchfield (Conn.- N. Y.) <i>a</i>	41° 30'	73° 00'	1/4 degree	40	1 : 125,000
Little Falls.....	43° 00'	74° 45'	1/16 degree	20	1 : 62,000
Lockport <i>b</i>	43° 00'	78° 30'	do	20	1 : 62,500
Long Lake.....	44° 00'	74° 15'	do	20	1 : 62,500
Lowville.....	43° 45'	75° 15'	do	20	1 : 62,500
Loon Lake.....	44° 30'	74° 00'	do	20	1 : 62,500
Lyon Mountain.....	44° 30'	73° 45'	do	20	1 : 62,500
Luzerne.....	43° 15'	73° 45'	do	20	1 : 62,500
McKeever.....	43° 30'	75° 00'	do	20	1 : 62,500
Macedon.....	43° 00'	77° 15'	do	20	1 : 62,500
Margaretville.....	42° 00'	74° 30'	do	20	1 : 62,500
Masena.....	44° 45'	74° 45'	do	20	1 : 62,500
Medina.....	43° 00'	78° 15'	do	20	1 : 62,500
Mettawee (N. Y.- Vt.) <i>c</i>	43° 00'	73° 00'	1/4 degree	40	1 : 125,000
Mexico.....	43° 15'	76° 00'	1/16 degree	20	1 : 62,500
Millbrook (N. Y.- Conn.).....	41° 45'	73° 30'	do	20	1 : 62,500
Montauk.....	41° 00'	71° 45'	do	20	1 : 62,500
Monticello.....	41° 30'	74° 30'	do	20	1 : 62,500
Moers.....	41° 45'	73° 30'	do	20	1 : 62,500
Moravia.....	42° 30'	76° 15'	do	20	1 : 62,500
Moriches.....	40° 45'	72° 45'	do	20	1 : 62,500
Morrisville.....	42° 45'	75° 30'	do	20	1 : 62,500
Mount Marcy <i>d</i>	44° 00'	73° 45'	do	20	1 : 62,500
*Mount Marcy and vicinity <i>d</i>	44° 00'	73° 30'	1/4 degree	20	1 : 62,500
*Mount Marcy and vicinity forestry map <i>d</i>					
Naples.....	42° 30'	77° 15'	1/16 degree	20	1 : 62,500
Navesink (N. J.- N. Y.) <i>e</i>	40° 00'	74° 00'	1/4 degree	20	1 : 125,000
Neversink.....	41° 45'	74° 30'	1/16 degree	20	1 : 62,500
New Berlin.....	42° 30'	75° 15'	do	20	1 : 62,500
New Brunswick (N. J.- N. Y.) <i>e</i>	40° 15'	74° 15'	do	10	1 : 62,500
Newburg.....	41° 30'	74° 00'	do	20	1 : 62,500
Newcomb.....	43° 45'	74° 00'	do	20	1 : 62,500
New London (Conn.- N. Y.).....	41° 15'	72° 00'	do	20	1 : 62,500
New York City and vicinity (N. Y.- N. J.) <i>f</i>	40° 22' 1/2	73° 40'	35/96 degree	20	1 : 62,500
Niagara <i>g h</i>	43° 00'	78° 30'	1/4 degree	20	1 : 125,000
Niagara Falls <i>g h i</i>	43° 00'	79° 00'	1/16 degree	20	1 : 62,500
*Niagara Falls and vicinity <i>h</i>	43° 00'	78° 45'	5/36 degree	20	1 : 62,500

* Out of print.
x Elmira, Ithaca, Watkins and Waverly sheets, on scale of 1 : 62,500, have been reduced and form Watkins Glen sheet, on scale of 1 : 125,000.
y Shows wooded areas.
z Mount Marcy and vicinity map includes Ausable, Elizabethtown, Lake Placid and Mount Marcy sheets. Mount Marcy and vicinity forestry map uses the same base.
a Cornwall sheet, on scale of 1 : 62,500, has been reduced and forms part of Litchfield sheet, on scale of 1 : 125,000.
b Lockport, Niagara Falls, Olcott, Tonawanda and Wilson sheets, on scale of 1 : 62,500, have been reduced and form parts of Niagara sheet, on scale of 1 : 125,000.
c Cambridge, Fort Ann and Pawlet sheets, on scale of 1 : 62,500, have been reduced and form parts of Mettawee sheet, on scale of 1 : 125,000.
d Mount Marcy and vicinity map includes Ausable, Elizabethtown, Lake Placid and Mount Marcy sheets. Mount Marcy and vicinity forestry map uses the same base.
e New Brunswick and Sandy Hook sheets, on scale of 1 : 62,500, have been reduced and form parts of Navesink sheet, on scale of 1 : 125,000.
f New York City and vicinity map includes Brooklyn, Harlem, Paterson, Staten Island, and parts of Hempstead, Oyster Bay and Sandy Hook sheets.
g Lockport, Niagara Falls, Olcott, Tonawanda and Wilson sheets, on scale of 1 : 62,500, have been reduced and form parts of Niagara sheet, on scale of 1 : 125,000.
h Niagara Falls and vicinity map includes Niagara Falls, Tonawanda and Wilson sheets.

Published Topographic Maps in New York State — Continued.

NAME OF ATLAS SHEET.	POSITION OF SOUTH-EAST CORNER OF SHEET.		Area covered.	Contour interval.	Scale.
	Latitude.	Longitude.			
Niagara River and vicinity i. ....	.....	.....	.....	<i>Feet.</i> 20	1 : 62,500
Nineveh.	42° 00'	75° 30'	1/16 degree	20	1 : 62,500
North Creek.	43° 30'	73° 45'	do	20	1 : 62,500
Northport j.	40° 45'	73° 15'	do	20	1 : 62,500
Norwalk (Conn.— N. Y.)	41° 00'	73° 15'	do	20	1 : 62,500
Norwich.	42° 30'	75° 30'	do	20	1 : 62,500
Nunda.	42° 30'	77° 45'	do	20	1 : 62,500
Oak Orchard.	43° 15'	78° 00'	do	20	1 : 62,500
Ogdensburg.	44° 30'	75° 15'	do	20	1 : 62,500
Olcott k.	43° 15'	78° 30'	do	20	1 : 62,500
Old Forge.	43° 30'	74° 45'	do	20	1 : 62,500
Olean.	42° 00'	78° 15'	do	20	1 : 62,500
Oneida.	43° 00'	75° 30'	do	20	1 : 62,500
Ontario Beach l.	43° 15'	77° 30'	do	20	1 : 62,500
Oriskany.	43° 00'	75° 15'	do	20	1 : 62,500
Orwell.	43° 30'	75° 45'	do	20	1 : 62,500
Oswego m.	43° 15'	76° 30'	do	20	1 : 62,500
Oswego special m.	43° 15'	76° 20'	do	20	1 : 62,500
Ovid.	42° 30'	76° 45'	do	20	1 : 62,500
Owego n.	42° 00'	76° 15'	do	20	1 : 62,500
Oxford.	42° 15'	75° 30'	do	20	1 : 62,500
Oyster Bay (N. Y.— Conn.) o.	40° 45'	73° 30'	do	20	1 : 62,500
Palmyra.	43° 00'	77° 00'	do	20	1 : 62,500
Paradox Lake.	43° 45'	73° 30'	do	20	1 : 62,500
Passaic (N. J.— N. Y.) p.	40° 30'	74° 00'	1/4 degree	20	1 : 125,000
Paterson (N. J.— N. Y.) o p.	40° 45'	74° 00'	1/16 degree	20	1 : 62,500
Pawlet (Vt.— N. Y.) q.	43° 15'	73° 00'	do	20	1 : 62,500
Penn Yan.	42° 30'	77° 00'	do	20	1 : 62,500
Phelps.	42° 45'	77° 00'	do	20	1 : 62,500
Phoenicia.	42° 00'	74° 15'	do	20	1 : 62,500
Piseco Lake.	43° 15'	74° 30'	do	20	1 : 62,500
Pitcher.	42° 30'	75° 45'	do	20	1 : 62,500
Pittsfield (Mass.— N. Y.) r.	42° 15'	73° 15'	do	20	1 : 62,500
Plainfield (N. J.— N. Y.)	40° 30'	74° 15'	do	20	1 : 62,500
Plattsburg (N. Y.— Vt.)	44° 30'	73° 15'	do	20	1 : 62,500
Portage.	42° 30'	78° 00'	do	20	1 : 62,500
Port Henry (N. Y.— Vt.)	44° 00'	73° 15'	do	20	1 : 62,500
Port Jervis (N. Y.— N. J.— Pa.)	41° 15'	74° 30'	do	20	1 : 62,500
Port Leyden.	43° 30'	75° 15'	do	20	1 : 62,500
Potsdam.	44° 30'	74° 45'	do	20	1 : 62,500
Poughkeepsie.	41° 30'	73° 45'	do	20	1 : 62,500
Pulaski.	43° 30'	76° 00'	do	20	1 : 62,500
Pultneyville.	43° 15'	77° 00'	do	20	1 : 62,500
Ramapo (N. Y.— N. J.)	41° 00'	74° 00'	do	20	1 : 62,500
Raquette Lake.	43° 45'	74° 30'	do	20	1 : 62,500
Red Mills.	44° 45'	75° 15'	do	20	1 : 62,500
Remsen.	43° 15'	75° 00'	do	20	1 : 62,500
Rhinebeck.	41° 45'	73° 45'	do	20	1 : 62,500
Richfield Springs.	42° 45'	74° 45'	do	20	1 : 62,500
Richmondville.	42° 30'	74° 30'	do	20	1 : 62,500
Ridgeway.	43° 15'	78° 15'	do	20	1 : 62,500

i Niagara River and vicinity includes parts of all sheets bordering on Niagara river.
j Babylon, Fire Island, Northport and Setauket sheets, on scale of 1 : 62,500, have been reduced and form Islip sheet, on scale of 1 : 125,000.
k Lockport, Niagara Falls, Olcott, Tonawanda and Wilson sheets, on scale of 1 : 62,500, have been reduced and form parts of Niagara sheet, on scale of 1 : 125,000.
l Rochester special sheet includes parts of Rochester and Ontario Beach sheets.
m Oswego special sheet includes parts of Oswego and Fulton sheets.
n Apalachin, Dryden, Harford and Owego sheets, on scale of 1 : 62,500, have been reduced and form Catatonk sheet, on scale of 1 : 125,000.
o New York City and vicinity map includes Brooklyn, Harlem, Paterson, Staten Island and parts of Hempstead, Oyster Bay and Sandy Hook sheets.
p Paterson and Staten Island sheets, on scale of 1 : 62,500, have been reduced and form parts of Passaic sheet, on scale of 1 : 125,000.
q Cambridge, Fort Ann and Pawlet sheets, on scale of 1 : 62,500, have been reduced and form parts of Mettawee sheet, on scale of 1 : 125,000.
r Pittsfield and Sheffield sheets, on scale of 1 : 62,500, have been reduced and form parts of Housatonic sheet, on scale of 1 : 125,000.

Published Topographic Maps in New York State — Continued.

NAME OF ATLAS SHEET.	POSITION OF SOUTH-EAST CORNER OF SHEET.		Area covered.	Contour interval.	Scale.
	Latitude.	Longitude.			
Riverhead	40° 45'	72° 30'	1/16 degree	<i>Feet.</i> 20	1 : 62,500
Rochester <i>s</i>	43° 00'	77° 30'	do	20	1 : 62,500
Rochester special <i>s</i>	43° 05'	77° 30'	do	20	1 : 62,500
Rosendale	41° 45'	74° 00'	do	20	1 : 62,500
Rouse Point (N. Y. — Vt.)	44° 45'	73° 15'	do	20	1 : 62,500
Sacketts Harbor	43° 45'	76° 00'	do	20	1 : 62,500
Sag Harbor	40° 45'	72° 15'	do	20	1 : 62,500
St. Regis	44° 15'	74° 15'	do	20	1 : 62,500
Salamanca	42° 00'	78° 30'	do	20	1 : 62,500
Sandy Hook (N. J. — N. Y.) <i>t u</i>	40° 15'	74° 00'	do	10	1 : 62,500
Sangerfield <i>v</i>	42° 45'	75° 15'	do	20	1 : 62,500
Santanoni	44° 00'	74° 00'	do	20	1 : 62,500
Saranac	44° 15'	74° 00'	do	20	1 : 62,500
Saratoga	43° 00'	73° 45'	do	20	1 : 62,500
Schenectady <i>w</i>	42° 45'	73° 45'	do	20	1 : 62,500
Schoharie	42° 30'	74° 15'	do	20	1 : 62,500
Schroon Lake	43° 45'	73° 45'	do	20	1 : 62,500
Schunemunk	41° 15'	74° 00'	do	20	1 : 62,500
Schuylerville	43° 00'	73° 30'	do	20	1 : 62,500
Setauket <i>x</i>	40° 45'	73° 00'	do	20	1 : 62,500
Sheffield (Mass. — Conn. — N. Y.) <i>y</i>	42° 00'	73° 15'	do	20	1 : 62,500
Shelter Island	41° 00'	72° 15'	do	20	1 : 62,500
Silver Creek	42° 30'	79° 00'	do	20	1 : 62,500
Skaneateles	42° 45'	76° 15'	do	20	1 : 62,500
Slide Mountain	41° 45'	74° 15'	do	20	1 : 62,500
Sodus Bay	43° 15'	76° 45'	do	20	1 : 62,500
Stamford (Conn. — N. Y.)	41° 00'	73° 30'	do	20	1 : 62,500
Staten Island (N. J. — N. Y.) <i>z a</i>	40° 30'	74° 30'	do	20	1 : 62,500
Stonington (Conn. — R. I. — N. Y.)	41° 15'	71° 45'	do	20	1 : 62,500
Stony Creek	43° 15'	74° 00'	do	20	1 : 62,500
Stony Island	43° 45'	76° 15'	do	20	1 : 62,500
Syracuse	43° 00'	76° 00'	do	20	1 : 62,500
Taberg	43° 15'	75° 30'	do	20	1 : 62,500
Taconic (N. Y. — Mass. — Vt.) <i>b</i>	42° 30'	73° 00'	1/4 degree	40	1 : 125,000
Tarrytown (N. Y. — N. J.)	41° 00'	73° 45'	1/16 degree	20	1 : 62,500
Theresa	44° 00'	75° 45'	do	20	1 : 62,500
Thirteenth Lake	43° 30'	74° 00'	do	20	1 : 62,500
Ticonderoga (N. Y. — Vt.)	43° 45'	73° 15'	do	20	1 : 62,500
Tonawanda <i>c d e</i>	43° 00'	78° 45'	do	20	1 : 62,500
Troy <i>f</i>	42° 30'	73° 30'	do	20	1 : 62,500
Tully	42° 45'	76° 00'	do	20	1 : 62,500
Tupper Lake	44° 00'	74° 30'	do	20	1 : 62,500
Utica	43° 00'	75° 00'	do	20	1 : 62,500
Waddington	44° 45'	75° 00'	do	20	1 : 62,500
Warren (Pa. — N. Y.)	41° 45'	79° 00'	do	20	1 : 62,500
Watertown	43° 45'	75° 45'	do	20	1 : 62,500
Watkins <i>g</i>	42° 15'	76° 45'	do	20	1 : 62,500
Watkins Glen <i>g</i>	42° 00'	76° 30'	1/4 degree	40	1 : 125,000

s Rochester special sheet includes parts of Rochester and Ontario Beach sheets.
t New York City and vicinity map includes Brooklyn, Harlem, Paterson, Staten Island and parts of Hempstead, Oyster Bay and Sandy Hook sheets.
u New Brunswick and Sandy Hook sheets, on scale of 1 : 62,500, have been reduced and form parts of Naversink sheet, on scale of 1 : 125,000.
v Shows wooded areas.
w Albany and vicinity map includes Albany, Cohoes, Schenectady and Troy sheets.
x Babylon, Fire Island, Northport and Setauket sheets, on scale of 1 : 62,500, have been reduced and form Islip sheet, on scale of 1 : 125,000.
y Pittsfield and Sheffield sheets, on scale of 1 : 62,500, have been reduced and form parts of Housatonic sheet, on scale of 1 : 125,000.
z New York City and vicinity map includes Brooklyn, Harlem, Paterson, Staten Island, and parts of Hempstead, Oyster Bay and Sandy Hook sheets.
a Paterson and Staten Island sheets, on scale of 1 : 62,500, have been reduced and form parts of Passaic sheet, on scale of 1 : 125,000.
b Berlin and Hoosick sheets, on scale of 1 : 62,500, have been reduced and form parts of Taconic sheet, on scale of 1 : 125,000.
c Lockport, Niagara Falls, Olcott, Tonawanda and Wilson sheets, on scale of 1 : 62,500, have been reduced and form parts of Niagara sheet, on scale of 1 : 125,000.
d Niagara Falls and vicinity map includes Niagara Falls, Tonawanda and Wilson sheets.
e Niagara River and vicinity map includes parts of all sheets bordering on Niagara river.
f Albany and vicinity map includes Albany, Cohoes, Schenectady and Troy sheets.

Published Topographic Maps in New York State — Concluded.

NAME OF ATLAS SHEET.	POSITION OF SOUTH-EAST CORNER OF SHEET.		Area covered.	Contour interval.	Scale.
	Latitude.	Longitude.			
Waverly <i>g</i>	42° 00'	76° 30'	1/16 degree	<i>Feet.</i> 20	1 : 62,500
Wayland.....	42° 30'	77° 30'	do	20	1 : 62,500
Weedsport.....	43° 00'	76° 30'	do	20	1 : 62,500
West Canda Lakes.....	43° 30'	74° 30'	do	20	1 : 62,500
Westfield.....	42° 15'	79° 30'	do	20	1 : 62,500
West Point.....	41° 15'	73° 45'	do	20	1 : 62,500
Whitehall (N. Y.—Vt.).....	43° 30'	73° 15'	do	20	1 : 62,500
Willsboro (N. Y.—Vt.).....	44° 15'	73° 15'	do	20	1 : 62,500
Wilmurt.....	43° 15'	74° 45'	do	20	1 : 62,500
Wilson <i>h i</i>	43° 15'	78° 45'	do	20	1 : 62,500
Winfield.....	42° 45'	75° 00'	do	20	1 : 62,500

g Elmira, Ithaca, Watkins, and Waverly sheets, on scale of 1 : 62,500, have been reduced and form Watkins Glen sheet, on scale of 1 : 125,000.
h Lockport, Niagara Falls, Olcott, Tonawanda and Wilson sheets, on scale of 1 : 62,500, have been reduced and form parts of Niagara sheet, on scale of 1 : 125,000.
i Niagara Falls and vicinity map includes Niagara Falls, Tonawanda and Wilson sheets.

INDEX OF ILLUSTRATIONS.

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